

Using Diagram Editors

This chapter describes the diagram editors you use for creating, drawing and printing OM (Object Models), SC (State Charts), DP (Deployment), MSC (Message Sequence Charts) and HMSC (High-level Message Sequence Charts) diagrams. Another name for HMSC is “road map”.

This chapter contains information about the functionality, menus, dialogs and windows of the diagram editors. For a guide to how to create and edit MSCs, see chapter 42, *Editing MSC Diagrams*.

Note: SDL Editor

The SDL editor is not covered in this chapter. For information regarding the SDL editor please see chapter 44, *Using the SDL Editor, in the User's Manual*.

General

The editor described in this chapter is a combined OM, SC, DP, MSC and HMSC Editor. This editor is thus capable of showing five different types of diagrams, namely the Object Model (OM) diagrams, State Chart (SC) diagrams, Deployment (DP) diagrams, Message Sequence Chart (MSC) diagrams, and High-level MSC (HMSC) diagrams.

This combined editor is called **the editor** throughout this chapter. If only a specific editor is applied, that editor will be explicitly mentioned.

OM, SC, DP and HMSC diagrams are handled by one editor window, whereas MSC diagrams are handled by a separate editor window. This means that two editor windows are needed to handle all five diagram types.

The editor handling SDL diagrams is described in [chapter 44, *Using the SDL Editor*](#).

How to edit MSC diagrams is described more closely in [chapter 42, *Editing MSC Diagrams*](#).

Diagrams and Pages

The handling of diagrams and pages is common to the OM, SC, DP, MSC and HMSC diagrams. The editor can handle any number of diagrams.

The pages that the editor displays are always contained within a diagram. A diagram can contain any number of pages, but, must contain **at least one page**. The MSC and the DP Editor are exceptions as they always contain only **one** page. This page is enlarged when objects are added, etc.

The pages that are contained in a diagram are listed and handled according to a fixed order. While the order of pages is initially defined by the order in which the pages are added when created, pages can be renamed and rearranged with the *Edit* menu choice in the *Pages* menu.

This order is reflected in some of the menu choices that are related to pages. Also, the structure displayed by the Organizer will adopt the same order. See [“The Organizer” on page 39 in chapter 2, *The Organizer*](#).

The Editor User Interface and Basic Operations

The Editor User Interface

The editor window can be used for viewing OM, SC, DP, MSC and HMSC diagrams.

The general Telelogic Tau user interface is described in chapter 1, *User Interface and Basic Operations*.

These functions are provided:

- The *Entity Dictionary Window*, which provides a name reuse facility as well as information for link endpoints.
- A symbol menu where you select the symbols that are to be inserted.
- A text window where you may edit text associated with symbols.

When you edit **OM** diagrams, three auxiliary windows are also provided:

- The *Browse & Edit Class Dialog* which you use to browse amongst and inspect and edit OM classes distributed across page and diagram boundaries.
- The *Line Details Window* which allows you to inspect and edit the various attributes of OM lines.
- The *Symbol Details Window* which allows you to inspect and edit OM symbol attributes.

When you edit **DP** diagrams, two of the auxiliary windows are also available:

- The *Line Details Window* which allows you to inspect and edit the various attributes of DP lines.
- The *Symbol Details Window* which allows you to inspect and edit DP symbol attributes.

When you edit **MSC** diagrams this function is also available:

- An instance ruler which allows you to view the kinds of instances, even if the instance head symbols are not currently in view.

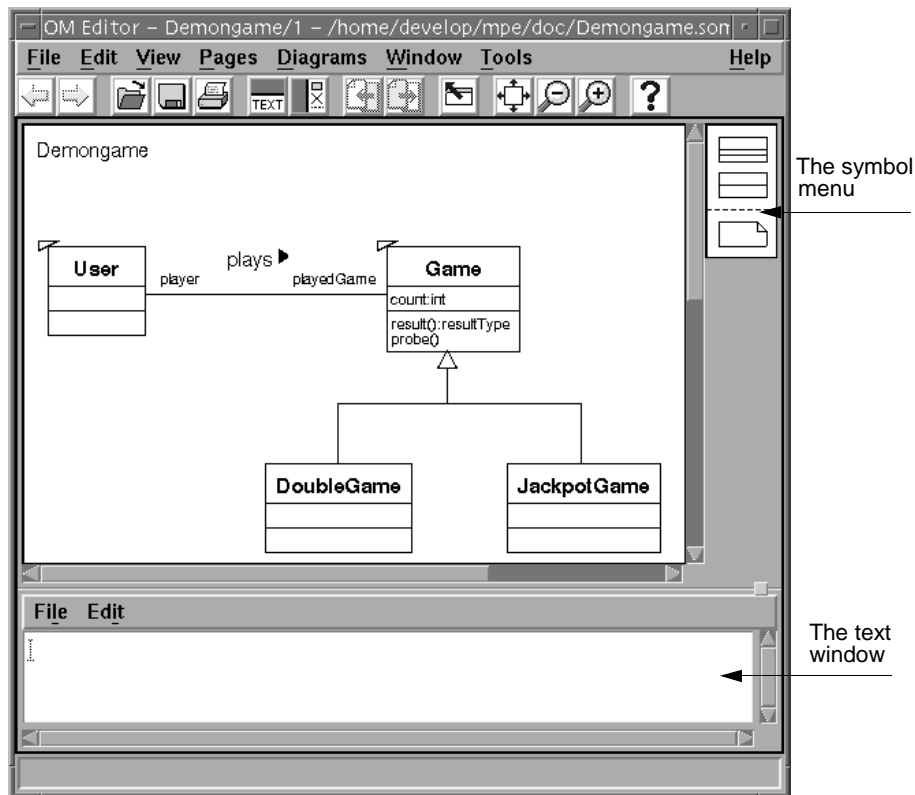


Figure 277: The editor window showing an OM diagram (on UNIX)

The Editor User Interface and Basic Operations

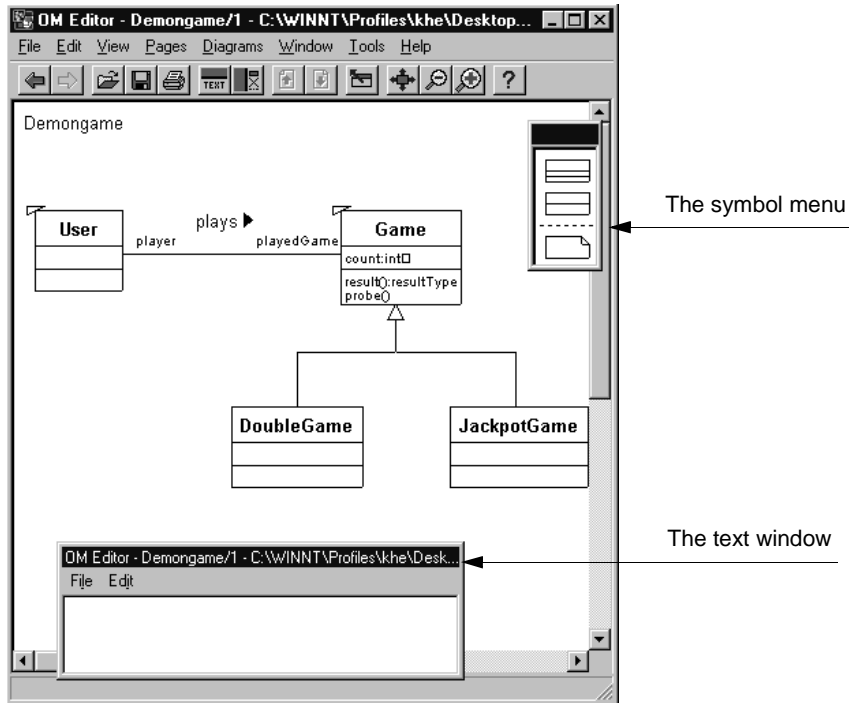


Figure 278: The editor window showing an OM diagram (in Windows)

The Editor Drawing Area

The drawing area is the part of the window which displays the symbols, lines and text that constitute a page (a diagram can contain multiple pages) or an MSC or DP diagram.

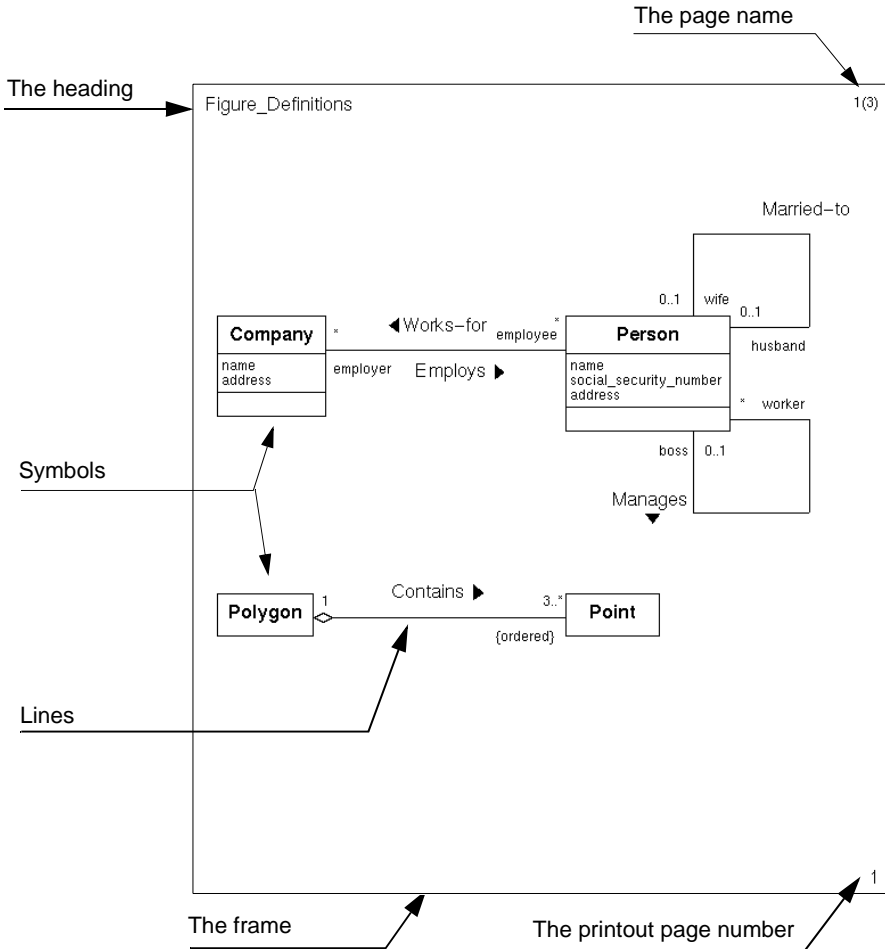


Figure 279: The drawing area with an OM page displayed

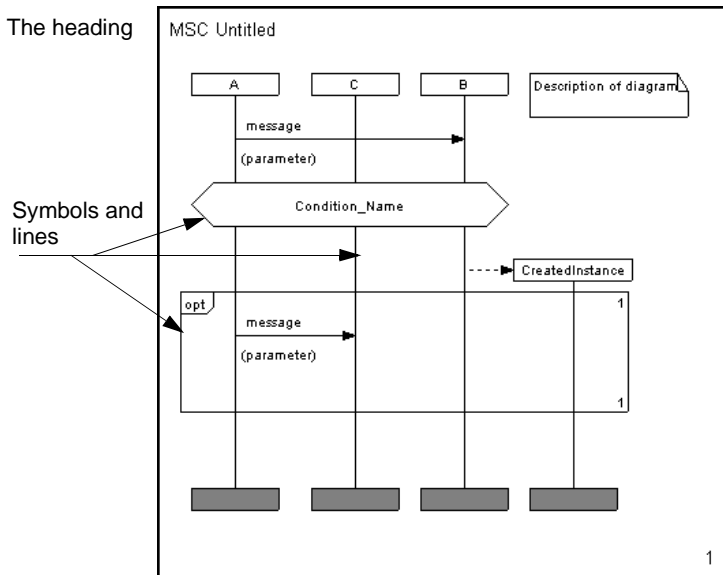


Figure 280: The drawing area with an MSC Diagram displayed

Drawing Area Boundaries

The drawing area is delimited by its boundaries, which correspond to the size of the page. No objects are allowed to be placed outside these boundaries. The drawing area uses a light background color, while the area outside the drawing area uses a grey pattern.

Within a diagram, each page has an individual size.

The Frame

The frame always coincides with the drawing area size. It is selectable but not editable. The frame is automatically selected with the Select All menu choice.

It is not possible to connect any diagram symbol to the frame. The frame only affects if the page is printed with or without a frame when printing selected objects, or when selected symbols are copied to a metafile (**Windows only**).

The Heading

OM, SC and DP only: The heading contains the diagram name. The heading is editable but cannot be moved. The editor performs a textual syntax check on the name used in the heading, see [“Diagram Name Syntax”](#) on page 1688.

MSC and HMSC only: The heading identifies the chart type and name. The type cannot be edited.

The Page Name

All editors except MSC and DP.

In the upper right corner, the page name and the total number of pages in the diagram (within parentheses) are identified. The page name cannot be moved. To rename a page, use the *Edit* menu choice in the *Pages* menu.

The Printout Page Number

If a diagram page is larger than the paper format that is defined, the diagram page will be split into several printout pages. In this case, page numbers will be created. The page numbering follows a “down first, then right” fashion.

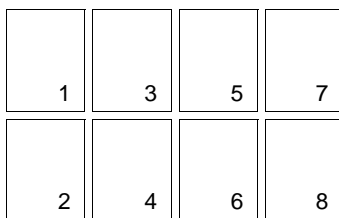


Figure 281: Page numbering in the editor

Grids

The editor uses two grids for an easy positioning of symbols, lines and textual elements:

- The symbol grid has a resolution of 5 * 5 mm, except for the **MSC** editor where it is 2.5 * 2.5 mm. All symbols adhere to the symbol grid.

- The line and text grid has a resolution of 2.5 * 2.5 mm. All lines and textual objects adhere to the line grid.

None of the grids can be changed.

Color on Symbols

All editors except MSC.

For each symbol type in the editor there is a preference for setting the color of the symbol. It is only the graphical part of the symbol and not the associated text(s) that will use the color setting. **On UNIX**, this setting is only valid on screen and all symbols will use the black color when printed on paper. **In Windows**, when using MSW Print the color settings will be sent to the printer as well. See [“OM/SC/HMSC/MSC/DP Editor Preferences” on page 273 in chapter 3, *The Preference Manager*](#).

The text symbol is the same in OM, SC, DP and HMSC diagrams and has thus only one preference.

Keyboard Accelerators

In addition to the standard keyboard accelerators, the editor features the following:

Accelerator	Reference to corresponding command
Ctrl+D	“Next page” on page 1586
Ctrl+U	“Previous page” on page 1586
Ctrl+T	“Symbol Details” on page 1628
<Delete>	“Clear” on page 1626
Ctrl+1	“Show Organizer” on page 15 in chapter 1, <i>User Interface and Basic Operations</i>
Ctrl+2	“Connect to Text Editor” on page 1642

Quick-Buttons

In addition to the generic quick-buttons in all Telelogic Tau tools, the editor tool bar contains the following quick-buttons. See also [“General Quick-Buttons”](#) on page 24 in chapter 1, *User Interface and Basic Operations*.



Text window on / off

Toggle the text window between visible and hidden (see [“Text Window”](#) on page 1617).



Symbol menu on / off

Toggle the symbol menu between visible and hidden (see [“Symbol Menu”](#) on page 1588).



Previous page (not valid for MSC and DP)

Open previous page in flow (similar to [“<Page Name>”](#) on page 1634). Dimmed if no previous page exists.



Next page (not valid for MSC and DP)

Open next page in flow (similar to [“<Page Name>”](#) on page 1634). Dimmed if no next page exists.



Toggle Scale

Toggle the scale between a scale to show the complete diagram in the window (similar to *Overview* in [“Set Scale”](#) on page 1631) and a scale of 100%. For MSCs, the scale is adjusted to fit the diagram *width* in the window instead of the complete diagram.



Make space for new events (MSC only)

Create space between two events (see [“Make Space”](#) on page 1629).



Remove space between two events (MSC only)

Remove the unrequired space between two events.



Instance ruler on / off (MSC only)

Toggle the instance ruler between visible and hidden (see [“Instance Ruler”](#) on page 1632).

Scrolling and Scaling

You can scroll the view vertically and horizontally by using the scroll-bars. The view may also be scrolled automatically when you move the cursor beyond the current view, for example when you move an object or add a symbol.

If you move the cursor close to the edge of the current view, the automatic scrolling is slow. If you move it further beyond, the scrolling is quicker.

You can scale the view by specifying a scale or by zooming in and out.

To specify a scale:

1. Select *Set Scale* from the *View* menu.
2. In the dialog that will be opened, you can either:
 - Use the slider for setting the scale and then click the *Scale* button.
 - Click the *Overview* button to adjust the drawing area to the size of the window. (This has the same effect as the *Scale Overview* quick-button.)



To zoom in or out:



- Click the quick-button for *zoom in* or *zoom out*.

Moving MSC Selection with Arrow Keys

You can move the selection using arrow keys in the MSC editor if there is one single symbol or line selected. The selection is moved along one instance in the vertical direction and between two instances in the horizontal direction.

In the MSC editor you are always in text editing mode, if there is a text to edit for the currently selected symbol. To move the symbol selection, press the arrow key one or several times in the direction you want to move. At first, only the text cursor position might be changed. But when the text cursor reaches the border of the text currently being edited (or

if there is no text being edited), then the symbol selection will be moved.

One shortcut is available for fast-forward moving to the next/previous condition or instance head symbol attached to the current instance: Shift+up or down arrow key.

Lock Files and Read-Only Mode

When you open a diagram or document file, e.g. `a.ssy`, a lock file `a.ssy.lock` is created. If another user tries to open the same diagram or document file before you close it, a dialog will appear informing the other user that the file is in use. There are two choices in the dialog:

- Open the file in read-only mode.
- Reset the lock and open the file in read-write mode. (This alternative should only be used if the existing lock file is obsolete.)

The read-write mode is the normal editing mode. In read-only mode, you are not allowed to make any changes to the diagram.

You will also enter read-only mode if you open a diagram file that you do not have write permission for. The read-only mode is indicated by the words *read-only* in the window title.

If you want to edit a diagram that is in read-only mode, there are two alternative actions:

- Change the file access rights in the file system to give you write permission for the diagram file. When that is done, you can change from read-only mode to read-write mode with the *Revert Diagram* operation.
- Select *File > Save As* to save the diagram in a new file with write permission.

Symbol Menu

The *symbol menu* contains the symbols that you can place into the drawing area.

On UNIX, the symbol menu is a fixed-sized, non-moveable auxiliary window, associated with the drawing area and placed to the right of it. Each editor window has its own symbol menu.

In Windows, the symbol menu is a fixed-sized, moveable window that can be placed anywhere on the screen, not necessary within the limits of the editor window. A single symbol menu is shared by all instances of the editor currently running.



The symbol menu can be made invisible and visible again with a menu choice, *Window Options*, or a quick-button. **In Windows**: When visible, the symbol menu will always be placed on top of the editor window, if the two windows overlap.

Basically, when you select a symbol in the symbol menu and click it into the drawing area, it is added to the diagram. This chapter does not describe how to work with symbols. Working with MSC symbols is described in [chapter 42, *Editing MSC Diagrams*](#). See also “[Working with Symbols](#)” on page 1835 in [chapter 44, *Using the SDL Editor*](#), as working with symbols in this editor is similar to working with symbols in the SDL Editor.

OM only: When a new class or object symbol is placed in the drawing area, it will automatically become an endpoint if the preferences [AlwaysEndpointClass](#) and [AlwaysEndpointObject](#), respectively, are set.

The contents of the symbol menu depends upon the type of diagram that is displayed in the editor window, as can be seen in [Figure 282](#). When you switch between diagrams of different types in the editor, the symbol menu changes accordingly.

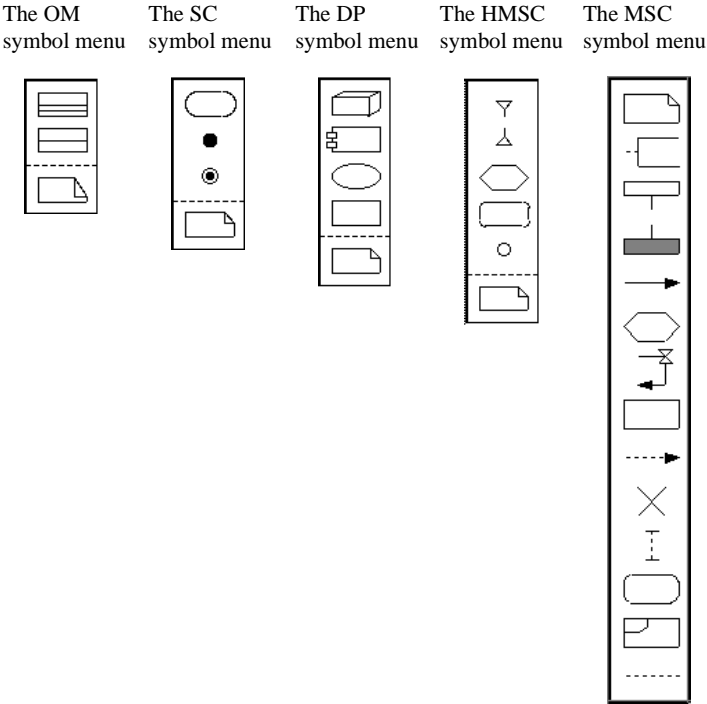


Figure 282: The editor symbol menus

About Symbols and Lines

The notation used for symbols and lines in the **OM Editor** complies with Static Structure (Class) diagrams defined in UML (Unified Modeling Language), version 1.3.

The notation used for symbols and lines in the **SC Editor** complies with State Chart diagrams defined in UML (Unified Modeling Language), version 1.3.

The notation used for symbols and lines in the **DP Editor** is based on the notation of Deployment and Component diagrams defined in UML (Unified Modeling Language), version 1.3.

The notation used for symbols and lines in the **HMSC Editor** complies with the ITU-T Z.120 recommendation from 1996. The comment symbol and the parallel frame symbol are not supported.

The notation used for symbols and lines in the **MSC Editor** complies with the ITU-T Z.120 recommendation from 1996. All MSC'96 symbols except the general ordering arrow are supported. Furthermore the MSC Editor does not support drawing of messages to the environment frame and message gates. Inline expressions are always global (i.e. they cover all instances).

For short explanations of when to use different symbols, see [appendix 45, Symbols and Lines – Quick Reference, on page 1987](#).

Symbols

Diagrams contain different types of symbols that describe the structure of the diagram. All symbols must be placed inside the frame symbol. [Figure 282 on page 1590](#) identifies these symbols in the symbol menu.


You can draw symbols in color, see [“Color on Symbols” on page 1585](#).

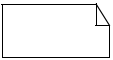
All symbols that are available in the symbol menu are selectable and moveable; they can be assigned arbitrary locations by you, with the exception that symbols are normally not allowed to overlap¹. **SC only:** symbols can however be placed inside a state symbol, see [“State Symbols” on page 1597](#).

1. In certain situations symbols will overlap as a consequence of automatic resizing when new text is entered in the symbols. Such symbols can only be moved to areas where an overlap does not occur.

Common Symbol

A symbol common for all the editors is:

Symbol Appearance	Symbol Name	Summary
	Text	Informal specification, global comments



Text Symbols

Text symbols contain informal text. It is not possible to connect any lines to a text symbol.

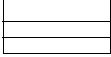
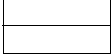
Double-clicking on a text symbol minimizes the symbol if not already minimized and maximizes the symbol if not already maximized.

Text symbols are typically used to add comments to diagrams or to convey system information (**HMSC Editor**: on a global level) that cannot be captured using the constructs offered by the editor.

When all of the text within a text symbol is in view, the upper right corner looks like a piece of paper that has been folded. When any portion of the text within a text symbol cannot be seen (because the text symbol is too small), the upper right corner looks like it has been clipped.

OM Symbols and Lines

See also [appendix 45, Symbols and Lines – Quick Reference, on page 1987](#).

Symbol Appearance	Symbol Name	Summary
	Class	Class definition
	Object	Class instance

Text in Class and Object Symbols

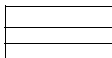
OM symbols have one or more text compartments, which should be filled with a textual expression. While the OM Editor does not require that symbol text compartments should contain text, it will perform a syntactic check on text compartments as soon as they are changed and deselected.

The syntax rules of OM diagrams are detailed in [“Object Model Syntax” on page 1687](#).

Note:

The OM Editor does not enforce syntax correctness in OM class and object symbols. This means that it is possible to use any conventions you desire for the textual contents of symbols; however, some features offered by the OM Editor will not be available, notably the *Browse & Edit Class* dialog.

Syntax checking on text in general is described in greater detail under [“Textual Syntax Checks” on page 1616](#).



Class Symbols

A class symbol is divided into three horizontal compartments. In order from the top, the compartments are:

- The name compartment
- The attributes compartment
- The operations compartment

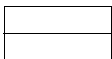
The text in these compartments is parsed by the OM Editor and should conform to the syntax specified in [“Class Symbol Syntax” on page 1688](#).

In the name compartment two more extra text fields can appear. If adding text to the stereotype and properties fields in the Symbol Details window, these texts will also be visible inside the name compartment. These texts are not subject to syntactic checks.



Figure 283: Class symbol with stereotype and properties texts

If you double-click a class symbol, the *Browse & Edit Class* dialog will be opened (see [“Browse & Edit Class Dialog” on page 1647](#)).



Object Symbols

Used to describe an OM object, or an instance of a class.

An object symbol differs from a class symbol in that it does not contain an operations compartment. In addition, the remaining compartments require a somewhat different syntax, see [“Object Symbol Syntax” on page 1690](#).

The object symbols handles stereotype and properties texts in the same way as the Class symbol.

If you double-click an object symbol whose name compartment includes a class name¹, the *Browse & Edit Class* dialog will be opened (see [“Browse & Edit Class Dialog” on page 1647](#)).

1. A class name is considered present only if the class name follows the object name after being separated by a colon ‘:’ character.

Lines

Lines are the graphical objects that interconnect objects. Normally a line interconnects two symbols but it could also connect a symbol with another line. The following types of lines interconnecting symbols are defined in OM diagrams (see [Figure 284](#)):

- Association
- Aggregation
- Generalization

The only line interconnecting a symbol and a line in OM diagrams is:

- Link Class

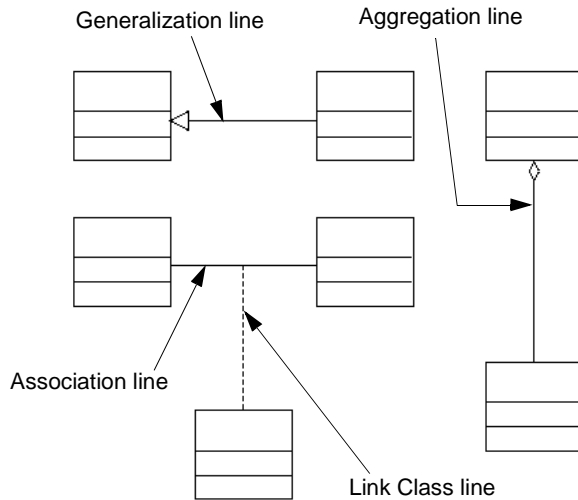


Figure 284: Lines in OM diagrams

To insert lines, select a class or object symbol, drag one of the *handles* that appear on the source symbol and connect it to the target symbol. There is one handle for each type of line.

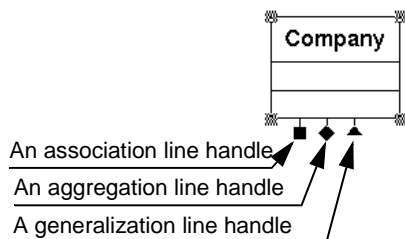


Figure 285: Handles for different line types

The Link Class line handle is placed on selected association and aggregation lines.

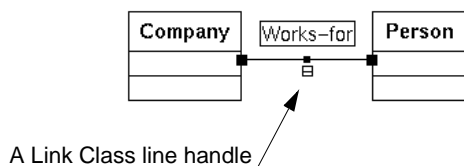


Figure 286: Handle for Link Class line

When a handle is clicked, the status bar shortly describes what the handle is used for and how to draw a line. This chapter does not describe how to work with lines. However, working with lines in the OM Editor is similar to working with lines in the SDL Editor; see [“Working with Lines”](#) on page 1866 in chapter 44, *Using the SDL Editor*.

Lines are always connected to objects; they are not allowed to exist on their own. A line is allowed to overlap any other object.




Lines are selectable; they can be moved and reshaped by you. Some layout work is performed automatically by the OM Editor.

Double-clicking on a line brings up the Line Details window (see [“Line Details Window”](#) on page 1652).

See also [“Line Attribute Objects”](#) on page 1609.

SC Symbols and Lines

See also [appendix 45, Symbols and Lines – Quick Reference, on page 1987](#).

Symbol Appearance	Symbol Name	Summary
	State	State definition.
	Start	Starting point of the SC.
	Termination	Termination point of the SC.

Text in State Symbols

State symbols have three text compartments which should be filled with textual expressions, but are allowed to remain empty. A syntactic check on a text compartment is performed as soon as it is changed and deselected.



State Symbols

A state symbol contains a state section which is divided into horizontal compartments. In order from the top, the compartments are:

- The Name compartment
- The Internal Activity compartment

The text in these compartments should conform to the syntax specified in [“State Symbol Syntax” on page 1692](#).

The state symbol may have an additional compartment with a graphic region holding a nested SC. This is called the *substate* compartment and states with this compartment are often called *hierarchical states* or *superstates*. The state will be extended with this compartment when a symbol is placed within it. The compartment disappears when the last symbol is removed from it.

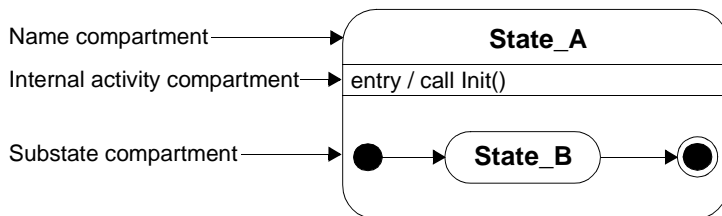


Figure 287: A state with its compartments

Text symbols are allowed to be placed inside the substate compartment but will not belong to the state. Thus, it will not automatically be part of the operations done on the state symbol, e.g. move, copy, etc.



Start Symbols

The start symbol is used to indicate where a SC starts.



Termination Symbols

The termination symbol is used to indicate where a SC terminates.

Lines

Lines are the graphical objects that interconnect objects. There is only one kind of line interconnecting symbols in SC diagrams, a transition line (see [Figure 284](#)):

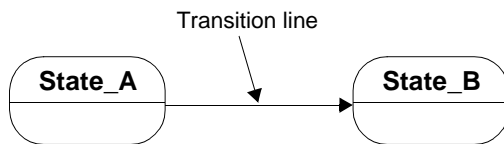


Figure 288: Transition line in SC diagrams

To insert lines, select a start or state symbol, drag the *handle* that appears on the source symbol and connect it to the target symbol.

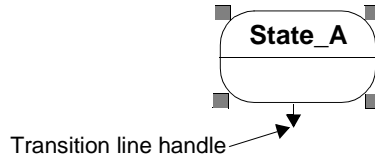


Figure 289: Handle for transition lines

When a handle is clicked, the status bar shortly describes what the handle is used for and how to draw a line. This chapter does not describe how to work with lines. However, working with lines in the SC Editor is similar to working with lines in the SDL Editor; see [“Working with Lines”](#) on page 1866 in chapter 44, *Using the SDL Editor*.

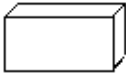



Lines are always connected to objects; they are not allowed to exist on their own. A line is allowed to overlap any other object.

Lines are selectable; they can be moved and reshaped by you. Some layout work is performed automatically by the SC Editor.

See also [“Line Attribute Objects”](#) on page 1609.

DP Symbols and Lines

See also [appendix 45, Symbols and Lines – Quick Reference, on page 1987](#).

Symbol Appearance	Symbol Name	Summary
	Node	A run-time physical object that represents a computational resource (see [5] on page 1702).
	Component	A physical, replacable part of a system that packages implementation (see [5] on page 1702).
	Thread	An OS thread, i.e. a light-weight process. Not to be mistaken for an OS task, i.e. a heavy-weight process.
	Object	An SDL entity, i.e. a system, block or process.

Double-clicking on a DP symbol brings up the Symbol Details window (see [“Symbol Details Window” on page 1670](#)).



Node Symbols

For node symbols the following text attributes can be edited:

- The name text
- The stereotype text
- The properties text

The name text can be edited directly in the symbol and should conform with the syntax described in [“Node Symbol Syntax” on page 1695](#). The other texts can be edited in the Symbol Details window and are not subject to syntactic checks.



Figure 290: Node symbol with stereotype and properties texts



Component Symbols

The text attributes of component symbols are the same and follow the same rules as those of node symbols. You can select the integration model for a component symbol from the Symbol Details dialog box. The syntax rules that apply are described in [“Component Symbol Syntax”](#) on page 1695.

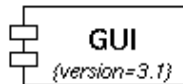


Figure 291: Component symbol with properties text



Thread Symbols

For thread symbols only the name text is visual. From the Symbol Details dialog box, you can edit thread priority, stack size, queue size and max signal size for a thread. The syntax rules described in [“Thread Symbol Syntax”](#) on page 1695 are applied.



Object Symbols

Object symbols have the following text attributes:

- The name text
- The stereotype text
- The properties text
- The qualifier text

In the Symbol Details window the stereotype, properties and qualifier texts can be added. If the stereotype text for an object symbol is **process** the appearance of the symbol is changed.

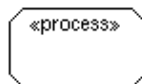


Figure 292: Object with stereotype “process”

The qualifier of an object symbol is displayed in the status bar when pointing the mouse at the symbol.

The syntax rules for the object symbol text attributes are described in [“Object Symbol Syntax”](#) on page 1695.

Lines

Lines are graphical objects that interconnect objects. Two types of lines are defined in DP diagrams (see [Figure 293](#)):

- Association
- Composite Aggregation

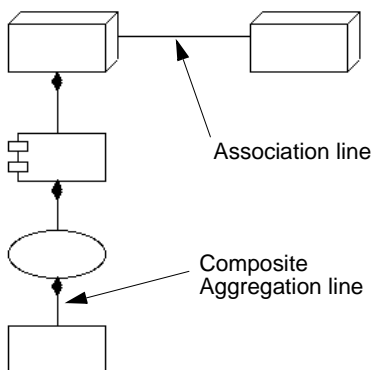


Figure 293: Lines in DP diagrams

To insert lines, select a symbol, drag one of the *handles* that appear on the source symbol and connect it to the target symbol. There is one handle for each type of line.

About Symbols and Lines

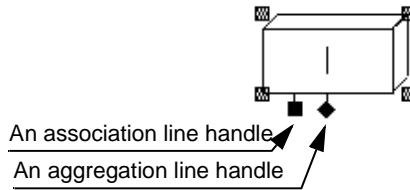


Figure 294: Handles for different line types

When a handle is clicked, the status bar shortly describes what the handle is used for and how to draw a line. This chapter does not describe how to work with lines. However, working with lines in the DP Editor is similar to working with lines in the SDL Editor; see [“Working with Lines”](#) on page 1866 in chapter 44, *Using the SDL Editor*.

Lines are always connected to objects; they are not allowed to exist on their own. A line is allowed to overlap any other object.






Lines are selectable; they can be moved and reshaped by you. Some layout work is performed automatically by the DP Editor.

Double-clicking on a line brings up the Line Details window (see [“Line Details Window”](#) on page 1667).

See also [“Line Attribute Objects”](#) on page 1609.

HMSC Symbols and Lines

See also [appendix 45, Symbols and Lines – Quick Reference, on page 1987](#).

Symbol Appearance	Symbol Name	Summary
	MSC Reference	Reference to another MSC diagram or MSC reference expression
	Condition	Expresses alternative path in an HMSC
	Connection Point	Expresses that lines are connected at this point
	Start	Start of the HMSC road map.
	End	End of the HMSC road map.



Reference Symbols

The reference symbol is used to refer to other (H)MSC's of the MSC document. The MSC references are objects of the type given by the references MSC.

MSC references may not only refer to a single MSC, but also to MSC reference expressions. MSC reference expressions are textual MSC expressions constructed from the operators **alt**, **par**, **seq**, **loop**, **opt**, **exc** and **subst**, and MSC references.

The text is parsed by the HMSC Editor and should conform to the syntax specified in [“Reference Symbol Syntax” on page 1698](#).

Double-clicking on a reference symbol opens the referenced MSC diagram. Note that if a reference symbol contains more than one name, you should place the cursor directly on one of the MSC names; otherwise an dialog is presented, see [“Navigate” on page 1644](#).



Condition Symbols

The condition symbol in HMSC's can be used to indicate global system states and impose restrictions on the MSC's that are referenced in the HMSC.

The text is parsed by the HMSC Editor and should conform to the syntax specified in "Condition Symbol Syntax" on page 1697.



Connection Point Symbols

The connection point symbol in HMSC's is used to indicate that two (or more) crossing lines are actually connected.



Start Symbols

The start symbol in HMSC's is used to indicate where an HMSC road map starts.



End Symbols

The end symbol in HMSC's is used to indicate where an HMSC road map ends.

Lines

Lines are the graphical objects that interconnect objects. There is only one kind of line in the HMSC Editor.

To insert lines, select any¹ of the symbols, drag the *handle* that appear on the source symbol and connect it to the target symbol.

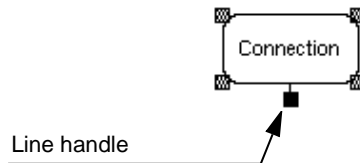


Figure 295: Symbol line handle

1. This does not apply to the stop symbols, since lines can not be drawn from it, only to it.

When a handle is clicked, the status bar shortly describes how to draw a line. This chapter does not describe how to work with lines. However, working with lines in the HMSC Editor is similar to working with lines in the SDL Editor; see “Working with Lines” on page 1866 in chapter 44, *Using the SDL Editor*.



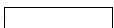





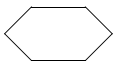



Lines are always connected to objects; they are not allowed to exist on their own. A line is allowed to cross (but not overlap) another line. Since lines in HMSC’s are directed, lines always starts at the bottom of a symbol and ends on the top of a symbol.









Lines are selectable; they can be moved and reshaped by you.

MSC Symbols and Lines

See also [appendix 45, Symbols and Lines – Quick Reference, on page 1987](#).

Symbols are the graphical objects that build up the contents of an MSC. Lines are the graphical objects that interconnect symbols. Lines are available in the symbol menu and are thus handled as symbols.

Symbol Appearance	Symbol Name	References to Z.120
	Text	Z.120 2.3
	Comment	Z.120 2.3
	Instance head	Z.120 4.2
	Instance end	Z.120 4.2
	Message	Z.120 4.3
	Message-to-self	Z.120 4.3
	Found message	Z.120 4.3
	Lost message	Z.120 4.3
	Condition	Z.120 4.6
	Timer ^a	Z.120 4.7
	Separate timer set ^b	Z.120 4.7
	Separate timer reset	Z.120 4.7

Symbol Appearance	Symbol Name	References to Z.120
	Separate timer consumed / timeout	Z.120 4.7
	Action	Z.120 4.8
	Create	Z.120 4.9
	Stop	Z.120 4.10
	Coregion	Z.120 5.1
	MSC Reference	Z.120 5.4
	Inline expression	Z.120 5.3
	Inline separator	Z.120 5.3

- The Z.120 symbols *timer set* and *time-out* are in this case merged into one symbol, the MSC Editor *timer* symbol.
- A separate timer reset or timer consumed symbol is created by creating a separate timer set symbol, followed by changing its status to either reset or consumed.

Syntax Checking on Symbols and Lines

The MSC Editor checks that the **symbols** are positioned in the MSC in accordance to rules governed by Z.120. Lines are always connected to at least one symbol, they are not allowed to exist on their own. The MSC Editor checks that **lines** are connected to symbols in accordance to Z.120.

Graphical Properties of Symbols and Lines

All symbols that are available in the symbol menu are selectable and moveable. They can be placed automatically or you may, as long as the Z.120 syntax rules are respected, assign them arbitrary locations.

Lines are selectable; you can move them and reconnect them. Some layout work is performed automatically when a line is drawn.

Most of the symbols are not resizable; these are indicated by grayed selection squares. Other symbols may be resized; this is shown by a filled selection square.

Textual Attributes

Textual objects are the textual attributes that are related to a symbol or a line.

Some MSC symbols have one or multiple text attributes. A text attribute should be filled with an MSC/PR expression (textual expression) that is syntactically correct according to Z.120, alternatively filled with some informal text if the MSC concept is used informally.

Text attributes related to messages and timers may be moved freely by you. Textual objects are allowed to overlap any other objects.

Line Attribute Objects

This section applies to OM, SC and DP only.

Line attribute objects represent additional items of information associated with lines. It is not possible to create free line attribute objects that are not associated with any line; line attributes are always associated to, and destroyed with, their respective lines.

SC only: Each transition line has a line attribute object, the *transition label*, which is pre-created by the SC Editor when you create a line. You may ignore this attribute or fill in the textual contents, as appropriate. The text should conform to the syntax specified in [“Transition Line Syntax” on page 1693](#).

OM only: Each type of line has a primary line attribute object, the *name* (for associations and aggregations) or *discriminator* (for generalizations) attribute, which is pre-created by the OM Editor when you create a line. You may ignore the primary attribute or fill in the textual contents, as appropriate.

DP only: Each type of line has a primary line attribute object, the *protocol* (for associations) or *multiplicity* (for aggregations) attribute, which is pre-created by the DP Editor when you create a line. You may ignore the primary attribute or fill in the textual contents, as appropriate.

OM and DP only: A number of secondary line attribute objects can be created for each line using the Line Details window (see [“Line Details Window” on page 1652](#) and [“Line Details Window” on page 1667](#) respectively). The exact number and types of line attribute objects depends on the type of line and is summarized in tables below.

Line attribute objects have a number of common characteristics:


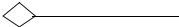
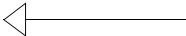

- They are conceptually attached to the closest line segment of the associated line and will be moved and redrawn as appropriate whenever the line’s layout is changed¹.
- A selected textual line attribute object is indicated by a small rectangle which shrink-wraps the actual text. If the textual attribute is editable, the text cursor will appear at the current insertion position inside the text, and the text window will contain the text of the selected attribute object.
- Textual line attribute objects always display their entire contents; it is not possible to collapse them to avoid displaying large amounts of text, as is the case with class and object symbols.
- **OM and DP only:** Syntax checks are not performed on textual line attribute objects.
- **OM and DP only:** All textual line attributes except the line’s primary attribute will be destroyed if their textual contents is cleared and the attribute is selected. To recreate a destroyed attribute, use the Line Details window.

OM only: While most line attributes can be moved freely and are allowed to overlap other objects, some attributes, such as the association qualifier, are restrained by graphical layout restrictions and cannot be freely moved.








1. While the results are normally what you would prefer, it is always possible to manually adjust the position of moveable line attributes after repositioning the line.

About Symbols and Lines

OM Line Attribute Objects

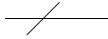
Name and Graphical Appearance	Line Attribute Objects (• Primary and – Secondary)
Association 	<ul style="list-style-type: none">• <u>Name</u> of the association<ul style="list-style-type: none">– <u>Reverse Name</u>– <u>Role Name</u>– <u>Role Multiplicity</u>– <u>Qualifier</u>– <u>Sorted</u>– <u>Ordered</u>– <u>Derived Attribute</u>– <u>Constraint</u>
Aggregation 	<ul style="list-style-type: none">• <u>Name</u> of the aggregation<ul style="list-style-type: none">– <u>Reverse Name</u>– <u>Role Name</u>– <u>Role Multiplicity</u>– <u>Qualifier</u>– <u>Sorted</u>– <u>Ordered</u>– <u>Composite</u>
Generalization 	<ul style="list-style-type: none">• <u>Discriminator</u> of the generalization
Link Class 	<ul style="list-style-type: none">• <i>No line attributes</i>

OM Aggregation/Association Attributes¹

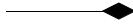
Attribute Appearance	Attribute Name (Properties)	Summary
	Name (Pre-created, Editable, Optional arrow)	Names a conceptual connection between object instances. While always bidirectional, the name usually denotes traversal of the association in the “forward” direction, as defined by the optional arrow.
	Reverse Name (Editable, Optional arrow)	Allows a separate name to be used when the link is traversed in the opposite direction.
	Qualifier (Editable, Not moveable)	Describes an association between two objects that is defined by the identity of a third object.
	Ordered (Not editable)	The <i>ordered</i> attribute puts additional constraints on a one-to-many association.
	Sorted (Not editable)	The <i>sorted</i> attribute puts additional constraints on a one-to-many association.
	Role Name (Editable)	Each end of an association is called a role. While redundant, well-named roles can sometimes facilitate analysis.
	Role Multiplicity (Editable)	Multiplicity is used to constrain the number of related objects. Multiplicity can be fixed, a closed range, an open range, or any combination of these.

1. While these attributes are available both for associations and aggregations, they are much more often used for associations. The use of these attributes for aggregations depends on how sharply the analysis or design separates between association and aggregation.

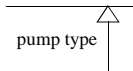
About Symbols and Lines

Attribute Appearance	Attribute Name (Properties)	Summary
	Derived Attribute (Not editable, Not moveable)	Indicates that the association represents redundant information, that can be calculated by following other associations.
<u>{initialized}</u>	Constraint (Editable)	Allows the specification of arbitrary constraints. The specified text is automatically placed between '{' and '}'.

OM Aggregation Attributes

Attribute Appearance	Attribute Name (Properties)	Summary
	Composite (Editable)	Indicates aggregation with strong ownership.

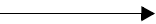
OM Generalization Attributes

Attribute Appearance	Attribute Name (Properties)	Summary
	Discriminator (Pre-created, Editable)	The discriminator describes which property of an object is being abstracted by a particular generalization relationship.


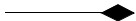
SC Line Attribute Objects

Name and Graphical Appearance	Line Attribute Objects
Transition <u><<TCP/IP>></u> →	<ul style="list-style-type: none"> Transition label of the transition

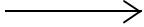
SC Transition Attributes

Attribute Appearance	Attribute Name (Properties)	Summary
event (arguments) [guard-condition] /actions 	Transition label (Pre-created, Editable)	Describes the transition. For a description of the syntax, see “Transition Line Syntax” on page 1693.

DP Line Attribute Objects

Name and Graphical Appearance	Line Attribute Objects (• Primary and – Secondary)
Aggregation 	<ul style="list-style-type: none"> <u>Name</u> of the association <ul style="list-style-type: none"> <u>Protocol</u> <u>Encoding</u> <u>Direction</u>
Composite Aggregation 	<ul style="list-style-type: none"> <u>Multiplicity</u> of the composite aggregation

DP Association Attributes

Attribute Appearance	Attribute Name (Properties)	Summary
	Protocol (Pre-created, Editable)	The protocol of the communication path.
<u>name</u>	Name (Editable)	The name of the communication path.
<u>{BER}</u>	Encoding (Editable)	The encoding of the communication path.
	Direction (Editable)	The direction of the communication path.

DP Aggregation Attributes

Attribute Appearance	Attribute Name (Properties)	Summary
<u>3,*</u>	Multiplicity (Pre-created, Editable)	Multiplicity is used to constrain the number of related objects. Multiplicity can be fixed or an infinite number.

Editing Text

General

The drawing area is a container for different types of objects that each may contain zero or more *text compartments*. In addition, the lines that connect objects also have zero or more *textual attribute objects*.

The editor allows these textual objects to be edited directly in the drawing area, allowing you to see directly how the textual object resizes to shrink-wrap the text.

To directly edit a textual object in the drawing area, simply position the text insertion cursor at the desired position in the text. To indicate that a textual object is being edited, a thin vertical bar designating the text insertion cursor appears at the selected text insertion point. As soon as you type some text, the keyboard input mode will change to *text editing mode*. This is indicated by a flashing and thicker insertion bar.

In text editing mode, all accelerator keys are interpreted as input to the text. As an example, the <Delete> key will in text editing mode delete a character, but in non-text editing mode it will remove (*Clear*) an entire symbol. This means that you can only use text editing keyboard accelerators like <Home>, <End>, <Ctrl+A> and <Ctrl+E> in text editing mode only.

While useful for quickly editing small texts, direct editing in the drawing area suffers from some restrictions:

- While it is possible to position the insertion cursor in the text using the mouse or the arrow keys, it is not possible to make any selections in the text, for deletion or replacement.

- If the text becomes large enough to cross the drawing area boundary, parts of the text will no longer be visible.

To alleviate these and other limitations, the editor offers a *text window* that provides a more complete set of text editing features. See [“Text Window” on page 1617](#) for more information. In addition, it is possible to use an external text editor for larger amounts of texts; see [“Connect to Text Editor” on page 1642](#).

Regardless of whether editing takes place directly in the drawing area or in the text window, the editor makes sure that the contents of both displayed texts are consistent, which makes it convenient to use both text editing mechanisms in the same diagram.

Textual Syntax Checks

Some texts in the editor are subject to syntactic checks as soon as they are changed. Errors detected during syntax checks will be displayed in the textual object by underlining the first characters at the position where the first syntax error was detected.

Minimum Size of Textual Symbols

While symbols are resized automatically to fit the containing text, the editor defines a minimum size for each symbol, ensuring that even empty symbols will be recognizable:

- The predefined minimum width of any symbol with text is 20 mm.
- The minimum height for symbols with text is calculated based on the height of the symbol font.
- The minimum height for text symbols is 10 mm.

Delayed Updating of the Drawing Area

When you edit the text in the text window, the updating of the drawing area is at least delayed for the value of the preference [FontText*MinimumTextUpdateDelay](#).

If the text is large, the update delay is extended proportionally. The text window is however always updated immediately.

In addition, any attempt to enter an illegal character will always result in an audible warning.

Text Window

The text window works in the same way for OM, SC, DP, MSC and HMSC diagrams. There is one text window common for OM, SC, DP and HMSC diagrams, and a separate text window for MSC diagrams.

On UNIX, the text window is a pane of the editor window and can be re-sized vertically.

In Windows, the text window is a resizable and moveable window that can be placed anywhere on the screen, not necessary within the limits of the editor window. A single text window is shared by all instances of the editor currently running.

If you select one object in the editor window, the text window is updated to contain the text associated with that object, but not if you select more than one text object.

Each line (except for the last line) in the text window is terminated by a carriage return, and may consist of any number of legal characters.

The text window provides a menu bar with two menus which are described in:

- [“File Menu of the Text Window” on page 1646](#)
- [“Edit Menu” on page 1625](#)

Hiding and Showing the Text Window



You can hide and show the text window with the [Window Options](#) command from the *View* menu, or by using a quick-button.

In Windows: When visible, the text window will always be placed on top of the editor window.

Searching and Replacing Text in an MSC

The text window provides standardized functions for searching and replacing text in an MSC.

If all the textual objects you want to search in are not visible (i.e. *instance name*, *instance kind*, *instance composition*, *message name* and *message parameters*) adjust the [Diagram Options](#).

Copying, Cutting and Pasting Text

The text window provides standardized clipboard functions for copying, cutting and pasting text between different **symbols, lines and text attributes**. These functions do not interfere with the clipboard functions for cutting, copying and pasting **objects**.

Programmable Function Keys (UNIX only)

On UNIX, it is allowed to tie a function key to a defined text string. When typing that defined function key, the programmed text string will be inserted at the current cursor location. You can customize your own programming of function keys.

Global X Resources

The function keys are set up as X resources. It is possible to set up both system default and user-defined X resources, allowing you to customize your environment. The X resources are defined in a file that is common for all users, namely

```
/usr/lib/X11/app-defaults/SDT
```

To program the function keys, insert the following lines anywhere into the SDT file:

```
/* Any suitable comment */
SDT*XmText.translations: #override \n\
<Key>F1: insert-string("F1Text") \n\
<Key>F2: insert-string("F2Text") \n\
<Key>F3: insert-string("F3Text") \n\
<Key>F4: insert-string("F4Text") \n\
<Key>F5: insert-string("F5Text") \n\
<Key>F6: insert-string("F6Text") \n\
<Key>F7: insert-string("F7Text") \n\
<Key>F8: insert-string("F8Text") \n\
<Key>F9: insert-string("F9Text")
/* Note the absence of \n\ on line 9 */
```

Note:

Omitting to define some of the function keys is permissible.

User-Defined X Resources

You can define your own function keys. This is done by defining the X-resources described above in a personal copy of the definition file and to store that file into your home directory:

```
~username/SDT
```

Alternatively, any directory designated by environment variable XAPPLRESDIR can be used.

Restrictions

1. Only one line for each function key can be defined. Attempting to define more than one line into one function key may cause an unpredictable result when pressing that key.

For instance, it is not certain that the following line will produce the expected result:

```
<Key>F1: insert-string("F1Line1\nLine2") \n\
```

2. Only the keys F1–F9 can be defined.

Changing Fonts on Text Objects

You may change the font faces and font sizes used in the textual objects displayed by the editor. All textual objects use the same font faces and font sizes, meaning that they cannot be changed individually and cannot be changed during an editor session.

The font faces which are available depend on the target system on which you are running the SDL suite.

Defining What Font to Use

To modify the desired font size and font face, you must use the Preference Manager. See [chapter 4, *Managing Preferences*](#).

Textual Objects Preferences

When the setting is in effect, the SDL suite diagram editors will use the font face names given by the preference settings

OME*ScreenFontFamily

OME*PrintFontFamily

to select font face names. Note that in this way you can select different font names for screen and for print.

On UNIX, if you leave the Editor*FontText*ScreenFontFamily preference setting empty, you will edit your documents using the *SDT Draft* font, but print them using the font you specified with the Editor*FontText*PrintFontFamily setting.

Supported Font Faces

On UNIX, the availability of font faces is determined by the version of the X Windows server which is running. With revision 5 or higher (X11 R5), scalable fonts are supported. In that case, the available list of pre-defined font faces would be:

- Times
- Helvetica
- Courier
- SDT Draft (mapped to the Schumacher font)
- Other (mapped to a user-defined font)

In Windows, the availability of font faces is determined by the TrueType fonts that are currently installed on the computer (use for instance the Windows Control Panel to determine what is available).

Default Font Face

The default font face is Helvetica (see the preferences [ScreenFontFamily](#) and [PrintFontFamily](#) described in “[OM/SC/HMSC/MS/DP Editor Preferences](#)” on page 273 in chapter 3, *The Preference Manager*).

On UNIX, if scalable fonts are not supported, the font face will be replaced by a *Schumacher* font which may be used in all circumstances (**MSC only**).

Default Font Size

Font sizes are described in “[NameTextHeight](#)” on page 274 and “[TextHeight](#)” on page 275 in chapter 3, *The Preference Manager*.

They are used as follows:

Common Font Sizes

Text Object	Font Size	Other
Heading symbol	NameTextHeight	
Text symbol	TextHeight	

OM Font Sizes

Text Object	Font Size	Other
Class symbol name	NameTextHeight	Bold
Object symbol name	NameTextHeight	Bold
Stereotype text	TextHeight	
Properties text	TextHeight	Italic

SC Font Sizes

Text Object	Font Size	Other
State symbol name	NameTextHeight	Bold

DP Font Sizes

Text Object	Font Size	Other
Symbol name	NameTextHeight	Bold
Stereotype text	TextHeight	
Properties text	TextHeight	Italic

HMSC Font Sizes

Text Object	Font Size
Reference Symbol	TextHeight
Condition symbol	TextHeight

MSC Font Sizes

Text Object	Font Size
All MSC special symbols	TextHeight

Determining Which Scalable Fonts Your Server Can Access (UNIX only)

On UNIX, use the `xlsfonts` command to list installed fonts. Font names containing 0 for width and height are scalable.

Example 296: How to determine which fonts are available

From the OS prompt, typing:

```
hostname% xlsfonts | grep "\-0\-0\-" | more
```

will return a list of accessible scalable fonts.

Scalable Fonts Under R5 Servers

To use scalable fonts under X11R5 you must normally first connect to a font server.

Example 297: How to Start the Font Server

1. Start the font server on any local host:

```
hostname% fs
```

2. Connect the server to `fs` indicating which host the font server is running on (which can be the same host that the X server is running on):

```
hostname% xset +fp tcp/<hostname>:7000
```

For further information see the X11R5 documentation or use `man fs` to read the manual page describing the font server you are running.

Disabling Font Scaling (UNIX only)

On UNIX, if the fonts look poor on the screen, a possible work-around is to disable the scaling option.

Note:

Disabling font scaling effectively disables WYSIWYG!

To do this, you should edit the SDT resource file.

1. Open the file SDT in a text editor.
2. Locate the line with the text: `SDT*sdtUseScalableFonts`
3. Change the line to `SDT*sdtUseScalableFonts: false`
4. Save the file and restart the SDL suite environment.

Menu Bars

The editor menu bar provides the following menus:

- File Menu
- Edit Menu
- View Menu
- Pages Menu
- Diagrams Menu
- Window Menu
- Tools Menu
- Help Menu

The Help menu is described in “Help Menu” on page 15 in chapter 1, *User Interface and Basic Operations*.

File Menu

The *File* menu supports the following commands on diagrams:

- New
- Open
- Save
- Save As
- Save a Copy As
- Save All
- Close Diagram
- Revert Diagram
- Print
- Exit

The *File* menu choices are described in “File Menu” on page 8 in chapter 1, *User Interface and Basic Operations*, except *Print* which is described in “*The Print Dialogs in the SDL Suite and in the Organizer*” on page 308 in chapter 5, *Printing Documents and Diagrams*.

Edit Menu

The *Edit* menu provides editing functions that you can perform on objects in a diagram, or on text in the text window. The *Edit* menu contains the following menu choices:

- Undo
- Cut, Copy and Paste
- Paste As
- Clear
- Clear Objects
- Keep Objects
- Expand/Collapse
- Line Details
- Symbol Details
- Class
- Drawing Size
- Select All
- Redirect
- Connect
- Status
- Make Space
- Decompose

Undo

This command restores the content of the drawing area to its state prior to the most recently performed operation. Text editing operations cannot be undone.

Editor	Operations you can undo
OM, SC, DP, HMSC	<ul style="list-style-type: none">• <u>Cut, Copy and Paste</u> and <u>Clear</u>• Resizing a page• Adding/moving symbols• Drawing/reshaping/redirecting lines
OM	<ul style="list-style-type: none">• Editing a symbol (<u>Symbol Details Window</u>)• Editing a line (<u>Line Details Window</u>)
DP	<ul style="list-style-type: none">• Editing a symbol (<u>Symbol Details Window</u>)• Editing a line (<u>Line Details Window</u>)

Editor	Operations you can undo
OM	<ul style="list-style-type: none"> Editing a class (Browse & Edit Class Dialog) <p>Note: Undoing an Edit Class operation will undo the changes in all affected diagrams.</p>
SC	<ul style="list-style-type: none"> Expanding/collapsing symbols
HMSC	<ul style="list-style-type: none"> Editing a symbol Editing a line
MSC	<ul style="list-style-type: none"> Cut, Copy and Paste and Clear Undo Redirect Connect Moving Objects Adding and Removing Objects

Cut, Copy and Paste

These commands provide standardized clipboard functions for copying, cutting and pasting objects in the drawing area or text in the text window.

You can interrupt a *Paste* operation by pressing <ESC>.

The **MSC** specific rules regarding the *Paste* command are described in [“Pasting in MSC Diagrams” on page 1673](#).

Paste As

Pastes the currently copied object (from the OM or Text Editor) as an OM symbol or MSC object in the drawing area. The object is transformed and a link is optionally created between the copied and pasted objects.

The Paste As dialog is opened. See [“The Paste As Command” on page 448](#) in chapter 10, [Imlinks and Endpoints](#).

Clear

This command removes the selected objects from the drawing area, or the selected text from the text window.

Also see “Deleting an Object” on page 461 in chapter 10, *Implinks and Endpoints*.

Clearing an *instance head* symbol or its *instance axis* line in an MSC diagram will also remove all objects that were connected with the instance axis regardless of if they were selected or not.

- A created instance left without “parent” is kept in the chart as static instance.
- Clearing an instance end reconnects the instance axis to the bottom of the chart.

Clear Objects

This **MSC** command removes all objects similar to the selected objects. For instance, select one message A object and one message B object and invoke this command to remove all occurrences of message A and B. To remove the empty spaces after removed objects, use *Rearrange*.

Keep Objects

This **MSC** command removes all objects of the same type as the selected objects that are not similar to the selected objects. For instance, select one message C object and one message D object and invoke this command to remove all messages except C and D. To remove the empty spaces after removed objects, use *Rearrange*.

Expand/Collapse

If a text symbol or a comment symbol is selected, this command allows you to expand or collapse the symbol from or to its minimum size.

If an MSC diagram is selected, the *Collapse* command collapses the selected instance axes to give you an overview of the diagram. A complex MSC can in this way be viewed in several decomposed MSCs. Two diagrams are created; one where the instances you have selected are collapsed into a decomposed instance and one where the behavior of the instances you have selected are shown. You can *Navigate* from a decomposed instance to the referenced diagram.

If an OM class, OM instance or SC state symbol is selected, this command selects whether all compartments should be displayed or not. A collapsed symbol will only display the name compartment (including

the stereotype and properties texts for an OM symbol), which is particularly useful when referring to a symbol that is defined elsewhere.

Line Details

This **OM and DP** command brings up the modeless Line Details window, that is used to inspect and edit the properties of the currently selected line. If there is none or more than one selected object, the items in the Line Details window will be dimmed.

The Line Details window and its appearance for different type of OM lines is described in [“Line Details Window” on page 1652](#). For DP lines it is described in [“Line Details Window” on page 1667](#).

Symbol Details

This **OM and DP** command brings up the modeless Symbol Details window, that is used to inspect and edit the stereotype and properties texts of the currently selected OM class or object symbol. If a DP node or component symbol is selected the stereotype and properties texts can be edited. For a component symbol, integration model can also be selected. For a DP thread symbol, the thread priority, stack size, queue size and max signal size texts are editable. For a DP object symbol the stereotype, properties and qualifier texts can be edited.

The Symbol Details window and its appearance are described in [“Symbol Details Window” on page 1657](#) (for OM symbols) and in [“Symbol Details Window” on page 1670](#) (for DP symbols).

Class

This **OM** command brings up the modal *Browse & Edit Class* dialog on the currently selected OM class or object. This dialog is used to inspect and edit OM classes and objects over page and diagram boundaries.

The Browse & Edit Class dialog is described in detail [“Browse & Edit Class Dialog” on page 1647](#).

Drawing Size

Issues a dialog where the width and height can be adjusted. The values will be saved.

Enlarging the drawing, the current page may not fit any longer into the paper that is defined with the Print preferences; the result may be a page that requires multiple sheets of paper when printed.

Select All

This operation selects all objects contained within the drawing area, or all text in the text window.

Status

This **MSC** command displays and possibly modifies the *status* of timers.

For more information see [“Displaying and Modifying Status” on page 1677.](#)

Make Space

This **MSC** command presents the *Make Space* dialog, where space for events may be inserted.

- The radio buttons *Before selected object* and *After selected object* define whether space for insertion of events should be created **before** or **after** the currently selected object.
- The *Space of* text field allows to specify how many events should be possible to insert.
- Clicking *OK* inserts space according to the number of events. All objects which are found after the currently selected object are pushed downwards.

Redirect

This **OM** command changes the orientation of the selected aggregation or generalization line.

This **SC** command changes the orientation of the selected SC transition line(s).

This **DP** command changes the orientation of the selected DP association line, if the line currently has a direction. The direction of a DP association line can be changed in the Line Details window.

This **MSC** command changes the orientation of a selected *message*. The new direction is indicated by a change in the orientation and position of the *message end* and of the *message parameters*.

Connect

This **MSC** command opens a dialog that is used to connect a selected *condition* or *MSC reference* symbol to one or multiple instances.

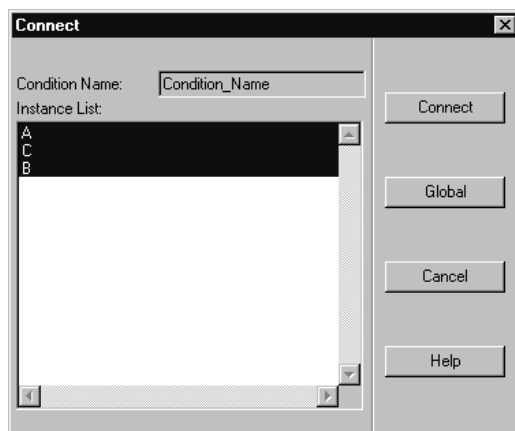


Figure 296: The Connect dialog (for a condition)

The *Name* field allows you to enter or change the name of the condition or MSC reference.

The *Instance List* lists all possible instances that are concurrent with the condition or MSC reference.

- Instances in the list that are selected or already connected are highlighted. Clicking an entry in the list toggles its state between highlighted and not highlighted.
- Select *Connect* connects the condition or MSC reference symbol to the instances in the instance list that are currently selected.
- Selecting *Global* connects the condition or MSC reference symbol globally to all instances in the list.

Decompose

This **MSC** command creates a new diagram of an instance axis in the original diagram. The instance axis you decompose is marked decomposed. In the new diagram you can specify the interior of the decomposed instance.

The messages to and from the decomposed instance are displayed as found and lost messages (see “[MSC Symbols and Lines](#)” on page 1607), showing the communication with other instance axes. The decomposed diagram is editable and it is displayed in the Organizer.

View Menu

The *View* menu provides rescaling functions and access to various options that affect the behavior of the editor. The *View* menu contains the following menu choices:

- *Set Scale*
- *Window Options*
- *Diagram Options*
- *Editor Options*
- *Insert Options*

Set Scale

This menu choice issues a dialog where you can adjust the scale.

Window Options

This menu choice issues a dialog where you can set the options that affect the window properties.

In the dialog, you can set if you want the following items to be displayed:

- *Tool Bar*
- *Status Bar*
- *Symbol Menu*

On UNIX, the space allocated to the symbol menu will be reused by the drawing area when you hide the symbol menu.

- *Instance Ruler*

The space allocated to the **MSC** instance ruler will be reused by the drawing area when you hide the instance ruler.

- *Text Window*

On UNIX, the space allocated to the text window will be reused by the drawing area when you hide the text window.

- *Page Breaks*

This option determines whether physical page breaks, with the appearance of dashed horizontal and vertical lines, should be displayed or not in the drawing area. These page breaks are defined by the print preferences. Also, a number is shown in the bottom of each printout page, indicating the physical page number when printed.

- *Show Grid*

Click *OK* to apply the options in the dialog to the current window only.

Click *All Windows* to apply the options in the dialog to all windows opened by the editor.

Diagram Options

This **MSC** command issues a dialog where you can set the options that determines what should be displayed in the drawing area:

- *Show Instance Name*
- *Show Instance Kind*
- *Show Instance Composition*
- *Show Message Name*
- *Show Message Parameters*

Click *OK* to apply the options to the current MSC. The diagram options will be saved when you save the file.

Editor Options

Opens a dialog where you can customize the behavior of the editor.

The options are controlled by toggle buttons. They are:

- *Always new Window*
This option indicates whether or not a new window should be opened when a new diagram is opened or created. The default behavior is not to open a new window.
- *Sound*
This option indicates whether or not improper actions in the editor, such as attempting to append a symbol to an illegal position, should be brought to your attention by producing an alert sound. The default value for this option is on.
- *Show Link Endpoints*
This option indicates whether endpoint markers should be displayed for symbols having link endpoints. The default value is on.

Insert Options

This **MSC** command issues a dialog where spacing between symbols may be specified. (The dimmed parts of the dialog are for future use.)

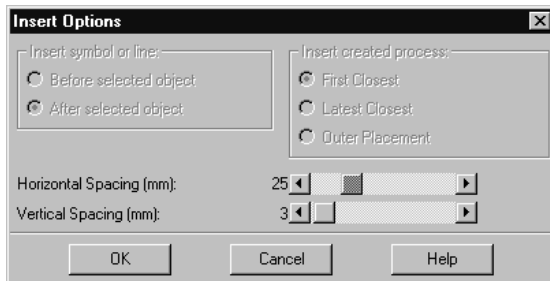


Figure 297: The Insert Options dialog

Spacing

This option allows to modify the space which is automatically inserted between the symbols and lines when appended to the chart.

There are two scales for setting the minimum horizontal distance between *instance axes* and the minimum vertical distance between *messages*.

Pages Menu

This section applies to all editors except MSC and DP.

The *Pages* menu holds commands that assist you in navigating among the pages in a diagram that are currently being edited in the editor. It also contains commands for adding, renaming and clearing pages as well as clipboard functions for copying, cutting and pasting entire pages.

The *Pages* menu contains the following menu choices:

- First
- <Page Name>
- Last
- Add
- Edit

First

This menu choice opens the first page contained in the diagram. The first page is defined according to the order of appearance in the *Edit Page* dialog.

<Page Name>

Activating the *Pages* menu presents up to four menu choices that consist of the names of the two pages that are sequentially immediately before and after the page being edited. If the first page of the diagram is being edited, the next four sequential pages are shown. If the last page of the diagram is edited, the previous four pages are shown.

Selecting one of these page names opens or restores that page in the editor. To open other pages, the *Edit* menu choice is used.

Last

This menu choice opens the last page of a diagram.

Add

This menu choice is a shortcut for adding one page to the current diagram. The *Add Page* dialog is issued and after pressing the *OK* button the new page is shown.

Edit

This menu choice allows to *Add*, *Rename*, *Move up*, *Move down*, *Clear*, *Cut*, *Copy* and *Paste* a page. Following this menu choice, a dialog is issued.

The meaning of the various components is as follows:

Edit Pages List

Presents a list with all pages that are included in the diagram. Clicking on a page in this list selects it and makes it the subject of the operation to follow.

Edit Button

Clicking this button opens the selected page and displays it in an editor window. The *Edit Page* dialog is closed.

Cut

Clicking this button removes the selected page from the diagram and saves it in the clipboard buffer.

Copy

Clicking this button copies the selected page into the clipboard buffer.

Paste

Clicking this button pastes the page contained in the clipboard buffer into the current diagram. A new dialog is issued.

The dialog allows to specify:

- The new name of the page. By default the page is autonumbered (the preference is described in “AutoNumberPages” on page 273 in chapter 3, *The Preference Manager*).
- If the new page should be pasted before or after the current page.

- Clicking the *Paste* button pastes the page according to the options as set up in the dialog and returns control to the *Edit Page* dialog.

Clear

This operation clears (removes) the selected page from the diagram.

To confirm the operation, click on *Clear*. The editor will automatically rename autonumbered pages.

Caution!

As stated in the dialog, *Clear* on a page cannot be undone.

Move up

If a diagram page is selected and you click the *Move up* button, the page will be moved up.

Note:

The undo function in the Organizer and in the SDL Suite will have no effect on page moves. It is, however, easy to undo a page move operation by just moving the page back again.

Move down

If a diagram page is selected and you click the *Move down* button, the page will be moved down.

Note:

The undo function in the Organizer and in the SDL Suite will have no effect on page moves. It is, however, easy to undo a page move operation by just moving the page back again.

Add

This command creates a new page which is added to the current diagram.

A new dialog is issued, in which you must insert the page name. You can insert the new page either before or after the current page.

The dialog allows to specify:

- The page name. By default the page is autonumbered (this preference is described in [“AutoNumberPages” on page 273 in chapter 3, *The Preference Manager*](#)).
- *Before / After current page*
The new page is inserted according to the status of these radio buttons.
- Clicking *OK* adds the page and returns control to the *Edit Page* dialog.

Rename

Click this button to open a dialog where you can rename the selected page.

Note:

Autonumbered pages cannot be renamed. The *autonumbered* option must first be turned off.

- Type in the new name of the page.
- Click *OK* to rename the page. Control is returned to the *Edit Page* dialog.

Autonumbered

When turning the *Autonumbered* option off, the editor first prompts to confirm the removal of autonumbering on that page.

- Click *Yes* to remove autonumbering on the page and then open a dialog where you can rename the page (see [“Rename” on page 1637](#)).
- Click *No* to cancel the operation. The page remains autonumbered.

Turning the *Autonumbered* option on applies a numeric name to the selected page (1, 2, etc...). A dialog is issued where:

- *Yes* auto-numbers the selected page.
- *All Pages* auto-numbers all pages contained in the diagram.
- *No* closes the dialog without autonumbering the pages.

Open this page first

This toggle button designates what page to be opened first when opening a diagram in the editor, if no particular page is specified.

***Diagrams* Menu**

The *Diagrams* menu records all diagrams that are opened by the editor. The menu choices are:

- *Back*
- *Forward*
- *<Diagram Name>*
- *List All*

Back

Select this menu choice to browse back to the diagram that was previously displayed in the window.

Forward

Select this menu choice to browse forward to the diagram that was displayed in the window before you selected *Back*.

<Diagram Name>

The last edited diagram always goes to the top of the list, and subsequently moves the other diagrams down a position. A maximum of 9 open diagrams can be shown. A tenth one will be put at the top of the list, but any subsequent opening of a diagram will only show the last 9 that have been opened.

Each item in the menu provides information about the diagram type, its name, a slash (‘/’) followed by a page name, a hyphen and, possibly, the file it is stored on (the file information is missing if the diagram has never been saved).

A diagram that is preceded by an asterisk (‘*’) denotes that it has been modified during the editor session.

Note:

OM, SC, DP and HMSC diagrams are listed in the same *Diagrams* menu, whereas MSC diagrams are listed only in the *Diagrams* menu of the MSC Editor window.

List All

This menu choice becomes available when a maximum of 9 open diagrams has been surpassed. When *List All* is selected, it provides a dialog containing all diagrams that are currently open in the editor. Select a diagram and click *Edit* to display it.

Window Menu

The *Window* menu contains the following menu choices:

- New Window
- Close Window
- Entity Dictionary
- Info Window
- <Window Name>
- List All

New Window

This command opens a new editor window containing a new view on the page, MSC or DP diagram contained in the source window from which this menu choice was operated. The page, MSC or DP diagram can be edited in any window.

Close Window

This option closes the open window, **but**, not necessarily the diagram.

If more than one editor window is opened, only the current window is closed and not the diagram. If the last open editor window is closed, the editor will act as if *Exit* has been chosen, possibly in conjunction with a save of information.

For more information, see “Close Diagram” on page 14 in chapter 1, *User Interface and Basic Operations*).

Entity Dictionary

Opens the Entity Dictionary window. See “The Entity Dictionary” on page 434 in chapter 10, *Implinks and Endpoints*.

Info Window

This **MSC** command issues a dialog as shown in [Figure 298](#), displaying additional information about the currently selected **MSC** object.

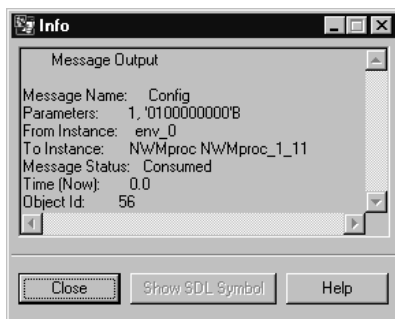


Figure 298: The Info dialog

The dialog presents:

- A scrollable information window providing information about the currently selected object. What information is available depends on the selected object. See [“Displaying Information About the Selected MSC Object”](#) on page 1678.

- *Show SDL Symbol*

A button that allows, **if the MSC has been automatically generated, using the SDL Simulator or SDL Validator**, to obtain a trace-back to the SDL source diagrams. Manually inserted symbols and lines do not, of course, contain any trace-back information. Clicking this button displays the SDL source symbol in an SDL Editor window. To behave properly, this feature requires that the SDL source diagram is consistent with the generated MSC, e.g. the SDL diagram may not have been modified so that the source symbol has been removed.

<Window Name>

If more than one editor window is open the other windows are listed here. The behavior of this list will be similar with the diagrams list in the [“Diagrams Menu”](#) on page 1638. The only difference is that the menu items will not provide the diagram file information.

List All

This menu choice will be available only if more than 9 editor windows are open, and have the same functionality as the List All menu choice in the *Diagrams* menu.

Tools Menu

The *Tools* menu contains the following menu choices:

- Show Organizer
- Link > Create
- Link > Create Endpoint
- Link > Traverse
- Link > Link Manager
- Link > Clear
- Link > Clear Endpoint
- Search
- Spelling > Comments
- Spelling > All Text
- Connect to Text Editor
- Show GR Reference
- Create Bookmark
- Convert SC to SDL
- Filter
- Tidy Up
- Navigate
- Rearrange
- Generate MSC PR
- Generate Input Script

All Link commands are described in “Link Commands in the Tools Menus” on page 442 in chapter 10, *Implinks and Endpoints*.

Search

This menu choice allows you to search for a text in the current diagram or document in an editor. The search can be restricted to a selected symbol type by using the *Search In* option menu.

You can search several diagrams and documents at the same time by using search from the Organizer, see “Search” on page 140 in chapter 2, *The Organizer*.

Spelling > Comments

Check the spelling of comments in the current diagram. For more information about the spelling operation, see “Spelling > Comments” on page 144 in chapter 2, *The Organizer*.

Spelling > All Text

Check the spelling of all text in the current diagram. For more information about the spelling operation, see “Spelling > Comments” on page 144 in chapter 2, *The Organizer*.

Connect to Text Editor

This command issues an external text editor and creates a temporary file from the currently selected text. The text can from now on only be edited in the external editor. The editor is updated every time the external text editor saves the temporary file. When the temporary file is no longer edited, the editing control returns to the editor.

Which external text editor to use is defined by the preference `SDT*TextEditor`.

Show GR Reference

This command issues a message where the graphical reference for the currently selected object is displayed.

The syntax of the graphical references used in the editor is described in chapter 19, *SDT References*.

Create Bookmark

This command creates a bookmark in the Organizer for the object you have currently selected.

Convert SC to SDL

This **SC** command transforms a State Chart to an SDL process diagram.

When the conversion is done, the SDL Editor displays the newly created process diagram. A new diagram is created for every conversion. The diagram resides in an unsaved SDL Editor buffer.

The transformation rules that are applied to the SC diagram are described in “Converting State Charts to SDL” on page 1658.

Filter

This SC command allows you to hide uninteresting states, transitions or signals in a statechart. All three filters are combined, making it possible to hide stateX, transition (stateA)-signalB->(stateC) and signalZ at the same time.

Information about hidden entities is saved in a collapsed text symbol, to be able to recreate the entities when the filter is removed. The text in the text symbol starts with “HiddenTransitions:”.

The dialog has the following options:

Apply filter

The current filter will be used when the dialog is closed with the OK button.

Create new editor buffer

A new statechart is created as a new editor buffer. If this option is off, the current statechart and editor buffer will be reused instead.

Always tidy up afterwards

The Tools>Tidy Up operation will be invoked after the filter has been applied. If this option is off, then the Tidy Up operation will only be invoked when needed, i.e. when states or transitions that was not visible before the operation become visible.

Create filter script text symbol

When the dialog is closed with the OK button, another dialog will appear, asking for a name for the filter. A text symbol, containing information about the current filter, will be created, starting with the text “Filter:<newline><filter name>”. To reuse a filter saved in this way, select the text symbol before invoking the filter operation.

Tidy Up

This SC command rearranges the graphical layout of states and transitions in the State Chart. State hierarchies are flattened out, i.e. states in states are replaced with other constructs. Positions and sizes are determined by a default layout algorithm.

Navigate

The *Navigate* menu choice displays a (H)MSC diagram referenced by the reference symbol or a decomposed MSC.

Since a reference symbol may contain more than one reference name the HMSC Editor presents a dialog where you can choose reference name.

Goto

Pressing this button will show the diagram selected in the Navigation names list. If an (H)MSC diagram with that name is not present in the Organizer, a dialog will be shown. If more than one (H)MSC with the same name is present in the Organizer, an error message will be issued.

There are a number of situations when the dialog is not presented and the referenced diagram is shown immediately:

1. There is only one reference name in the symbol.
2. The caret is positioned in a reference name. This name will be automatically selected for navigation.

For reference navigation to work correctly it is required that the expression in the symbol is syntactically correct so that the names in the symbol can be extracted. Check out [“Syntax rules in Symbols” on page 1696](#). If you try to navigate from a symbol with incorrect syntax you will be notified with a dialog that points out the location of the error in the reference symbol text.

If you select a symbol that is not present in the Organizer you will be presented with a dialog where you can create either an MSC or an HMSC diagram.

Rearrange

This **MSC** command rearranges the symbols and lines in the MSC diagram to get a compact version of the same diagram. This command might for instance be useful after having removed several signals from the diagram.

Generate MSC PR

With this **MSC and HMSC** command you can save an MSC using the Z.120 MSC/PR format. (MSC/PR can also be read by the MSC Editor,

see “[Managing MSCs](#)” on page 1732 in chapter 42, *Editing MSC Diagrams*). The MSC Editor normally stores the MSCs using a binary storage format.

To generate MSC/PR:

1. Display the MSC you want to generate MSC/PR from.
2. Select *Generate MSC PR* from the *Tools* menu. A dialog is issued.
3. Specify a file where to store the generated MSC/PR. The default file that the MSC Editor suggests consists of the name of the MSC, with the `.mpr` file extension, i.e. `<diagramname>.mpr`
4. Make sure the *Generate GR references*¹ radio button is turned on.
5. Click *Generate*.

Comment Symbols and MSC/PR

Since free comment symbols, i.e. comment symbols that are not connected to any other symbol, are not permitted in MSC/PR but can be defined using the MSC Editor, free comment symbols are converted to text symbols in the generated MSC/PR.

Generate Input Script

This **MSC** command makes it possible to convert an MSC expressed in a certain, restricted way to an input script that can be used as a script in the SDL Simulator UI. In the Simulator UI, use the *Execute>Input Script* menu choice or the *execute-input-script* command to execute an input script.

How MSCs should be expressed to be able to use them as test scripts for the SDL Simulator is described in “[Simulator Test > New Simulator](#)” on page 154 in chapter 2, *The Organizer*.

Note that normally, you do not manually convert MSCs to input scripts using this menu choice. Instead, the *Organizer Tools* menu choice [Simulator Test > New Simulator](#) auto-converts MSCs to input scripts when they are needed as test cases. Manual conversion is only needed if you

1. Event oriented MSC/PR describes the MSC using the order in which the events occur, i.e. starting with the top of the diagram and downwards, providing the feeling of a global event order.

want to stop working on the MSC level and start working on the textual Simulator UI command level instead.

File Menu of the Text Window

The *File* menu provides functions that transfer text from a file to the text window and vice-versa. The basic intention is to provide you a means to edit larger portions of text with a more suitable text editor. Another possibility to edit text externally is to use the *Connect to Text Editor* command in the *Tools* menu. The available menu choices are:

- *Import*
- *Export*

Import

Import imports the contents of a file into the text window and inserts the contents of the file at the current I-beam cursor position, possibly replacing selected text in the text window. A file selection dialog is issued, where the file to import text from is to be specified. The file name filter is set to *.txt by default.

Export

Export exports the text window contents to a file. A file selection dialog is issued, where the file to export the text to is to be specified. The file name filter is set to *.txt by default.

OM Editor Specific Information

Browse & Edit Class Dialog

The Browse & Edit Class dialog is opened when you select *Class* from the *Edit* menu. The dialog allows inspection of OM diagram classes and objects across page and diagram borders.

An object model class is defined as the union of the attributes and operations in the class and object symbols, see “[Class Definition Summary](#)” [on page 1687](#), and the purpose of the Browse & Edit Class dialog is to display and ensure consistency when editing this combined information.

The Browse & Edit Class dialog is a modal dialog which is divided in two parts. The browsing functionality is placed at the top part of the dialog, where all classes in the scope, and all occurrences of each class are listed in two option menus. Below, in the editing part, the name of the class, all attributes and all operations are available.

The Browse & Edit Class dialog is available when a single class or object symbol has been selected:

- If a class symbol is selected, the Browse & Edit Class dialog will operate on the class defined by that symbol. If the class name is empty or contains incorrect syntax, the Browse & Edit Class dialog will not be available.
- If an object symbol is selected, the Browse & Edit Class dialog will operate on the class that the object symbol instantiates. If the object symbol does not include the name of the class it instantiates, the Browse & Edit Class dialog will not be available.

Browse

By using the topmost part of the Browse & Edit Class dialog it is possible to browse amongst all class and object symbols within the scope. The scope is either the entire Organizer module where the diagram is contained, or the diagram itself if it is not contained in an Organizer module. The module concept is described in “[Module](#)” [on page 42](#) and in “[Module](#)” [on page 51](#) in chapter 2, *The Organizer*.

Edit

By using the lower part of the Browse & Edit Class dialog it is possible to edit the name, attributes and operations of a class. The change will propagate into all class symbols of this class in OM diagrams within the module where the diagram is contained. The attributes and operations will be presented in a list. This list is parsed information from the texts in the class symbols. If a particular text contains syntax errors, it may lead to that attributes and operations contained in the same text do not appear in this list.

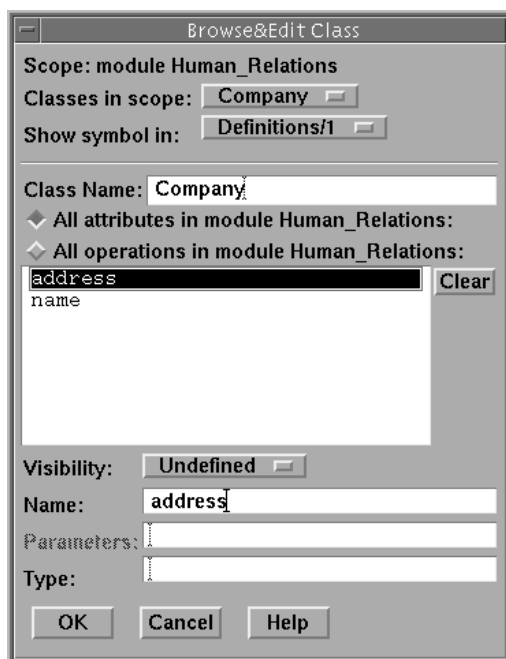


Figure 299: The Browse & Edit Class dialog

The Scope Label

The scope label is a non-editable text field that describes the scope that the Browse & Edit Class dialog is operating in. The scope can be either a single OM diagram or all OM diagrams within an Organizer module.

- If the diagram containing the object from which the Browse & Edit Class dialog was invoked is not part of a module in the Organizer, the scope label contains the text “Scope: diagram *<diagram name>*”.
- If the diagram containing the object from which the Browse & Edit Class dialog was invoked is part of a module in the Organizer, the scope label contains the text “Scope: module *<module name>*”.

The *Classes in Scope* Option Menu

The *Classes in Scope* option menu contains a list of all classes within the scope. By selecting one of the classes in this menu the corresponding symbol will be shown and selected in the drawing area.

The *Show Symbol in* Option Menu

One class can be represented by several class symbols. The *Show Symbol in* option menu lists all occurrences of the class currently selected in the *Classes in Scope* option menu. The notation in the menu is *<diagram-name>/<page-name>*. By selecting an occurrence in this menu the corresponding symbol will be shown and selected in the drawing area.

The *Class Name* Field

The name field is an editable text field that initially contains the name of the class that is being edited.

By editing the class name field, it is possible to update all occurrences of that class name in class and object symbols in the current scope when the *OK* button is clicked.

The *Attributes/Operations* Buttons

The Attributes and Operations buttons select whether the attributes/operations list will contain a list of all attributes or all operations defined for the selected class. Only one of the attributes and operations buttons will be selected at any time.

The *Attribute/Operations* List

The attributes/operations list contains an alphabetically sorted list of the attributes or operations defined for the currently selected class.

The **Clear** Button

The clear button removes the currently selected operation or attribute from the *Attribute/Operations* list.

By clearing an attribute or operation using the clear button, that attribute or operation will be removed from all relevant class and object symbols using the current class name in the current scope when the *OK* button is clicked.

The **Visibility** Option Menu

The visibility option menu contains the visibility of the currently selected attribute or operation in the *Attribute/Operations* list, if any.

By selecting one of the predefined values in this menu and later clicking the *OK* button, the visibility of the selected attribute or operation will be updated in all relevant class symbols using the current class name in the current scope.

The **Name** Field

The name field contains the name of the currently selected attribute or operation in the *Attribute/Operations* list, if any.

Editing this field will change the definition of that attribute or operation in all relevant class and object symbols using the current class name in the current scope when the *OK* button is clicked.

The **Parameters** Field

The parameters field is an editable text field that contains the parameters of a class operation. It is only editable when an operation is selected in the *Attribute/Operations* list.

Editing this field will change the definition of the selected operation in all relevant class and object symbols using the current class name in the current scope when the *OK* button is clicked.

The **Type** Field

The type field is an editable text field that is only editable when an attribute or an operation is selected in the *Attribute/Operations* list.

Depending on the current selection, the type field contains:

- If an attribute is selected, the type of that attribute, if any.
- If an operation is selected, the return type of that operation.

By editing this field, the type of the selected attribute or the return type of the selected operation and later clicking the *OK* button, the type of the selected attribute or operation will be updated in all relevant class and object symbols using the current class name in the current scope.

Note that default values for attributes cannot be inspected or changed in the Browse & Edit Class dialog.

The *OK* Button

The *OK* button will close the Browse & Edit Class dialog and update all appropriate class and object symbols in the diagrams in the current scope as described for the scope label.

Note that no changes are made in the diagrams until the *OK* button is clicked. This makes it possible to specify several changes in the dialog and later disregard them by clicking the *Cancel* button.

The values are syntactically checked, so it is not possible to add syntax errors to your classes by using the Browse & Edit Class dialog. Also, it may be impossible to delete syntactically incorrect text from symbols using the Browse & Edit Class dialog, since the Browse & Edit Class dialog relies on information obtained by parsing the relevant symbol text compartments.

It is possible to undo the changes made by the Browse & Edit Class operation. Note that this undo operation may affect more than one diagram.

The *Cancel* Button

The *Cancel* button will close the Browse & Edit Class dialog and discard any changes specified in the dialog. However, if the selection has changed in the drawing area after using any of the browsing functionality, this selection will not be canceled.

All changes made in the Browse & Edit Class dialog will be lost.

Line Details Window

The Line Details window is opened when you select *Line Details* from the *Edit* menu. It is used to inspect, and edit the properties of the currently selected line. In particular, most of the line attribute objects that are available for the different line types can only be created from the Line Details window¹.

Some line attribute objects contain editable text, and clearing that text, whether by editing in the Line Details window or directly in the diagram, will remove the attribute.

Changes made in the Line Details window will take immediate effect and will be shown in the drawing area. These changes can be undone with the *Undo* menu command.

Unlike the Browse & Edit Class dialog, the Line Details window is modeless and can remain open while you continue to work with the diagrams. The contents of the window will be updated to reflect the current selection. If there is none or more than one selected line, the fields in the Line Details window will be dimmed.

The OM Editor supports four different types of lines and the contents of the Line Details window depends on the type of the currently selected line:

- If an *Association* line is selected, all items except the Composite button in the Line Details window will be active. See [Figure 300](#).
- If an *Aggregation* line is selected, all items in the Line Details window will be active. See [Figure 301](#).
- If a *Generalization* line is selected, only a single editable text field, containing the generalization's discriminator, will be available. See [Figure 302](#).
- If a *Link Class* line is selected, all items in the Line Details window will be dimmed.
- If none or more than one line is selected, all items in the Line Details window will be dimmed.

1. Once created, however, all editable textual line attribute objects can be selected and edited directly in the diagram, without the use of the Line Details window.

OM Editor Specific Information

The screenshot shows a window titled "Line Details - At_A_Company/1". The main heading is "Association from Person to Person". It contains two columns of input fields. The first column is for the "Name" (set to "Married-to") and "Role names" (set to "wife"). The second column is for the "Reversed name" (empty) and "Role names" (set to "husband"). Both columns have "Role multiplicity" set to "0..1". There are checkboxes for "Arrow", "Ordered", and "Sorted" in each column. A "Qualifiers" field is at the bottom. At the very bottom are checkboxes for "Derived" and "Composite", a "Constraint" field with curly braces, and "Close" and "Help" buttons.

Association from Person to Person	
Name:	Reversed name:
Married-to	
<input type="checkbox"/> Arrow	<input type="checkbox"/> Arrow
Role names:	Role names:
wife	husband
Role multiplicity:	Role multiplicity:
0..1	0..1
<input type="checkbox"/> Ordered	<input type="checkbox"/> Ordered
<input type="checkbox"/> Sorted	<input type="checkbox"/> Sorted
Qualifiers:	
<input type="checkbox"/> Derived	Constraint: { }
<input type="checkbox"/> Composite	
Close	Help

Figure 300: The Line Details window when an association line is selected

The screenshot shows a window titled "Line Details - Definitions/1". The main heading is "Aggregation from Polygon to Point". It contains two columns of input fields. The first column is for the "Name" (set to "Contains") and "Role names" (empty). The second column is for the "Reversed name" (empty) and "Role names" (empty). Both columns have "Role multiplicity" set to "3..1". There are checkboxes for "Arrow", "Ordered", and "Sorted" in each column. A "Qualifiers" field is at the bottom. At the very bottom are checkboxes for "Derived" and "Composite", a "Constraint" field with curly braces, and "Close" and "Help" buttons.

Aggregation from Polygon to Point	
Name:	Reversed name:
Contains	
<input type="checkbox"/> Arrow	<input type="checkbox"/> Arrow
Role names:	Role names:
Role multiplicity:	Role multiplicity:
3..1	
<input type="checkbox"/> Ordered	<input type="checkbox"/> Ordered
<input type="checkbox"/> Sorted	<input type="checkbox"/> Sorted
Qualifiers:	
<input type="checkbox"/> Derived	Constraint: { }
<input type="checkbox"/> Composite	
Close	Help

Figure 301: The Line Details window when an aggregation line is selected

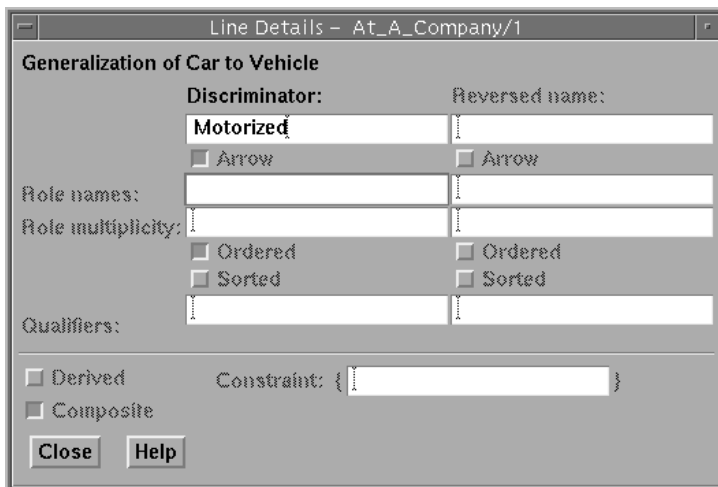


Figure 302: The Line Details window when a generalization line is selected

The Name Field

The *Name* field is an editable text field that contains the name of the selected aggregation or association.

Unlike the other text fields in the Line Details window, the line attribute object defined by the name field is permanent and is not destroyed even if the name field is cleared.

This field is only available when an aggregation or association line is selected.

The Discriminator Field

The *Discriminator* field is an editable text field that changes the discriminator text attribute of the generalization.

This field is only available when a generalization line is selected.

The Reversed Name Field

The *Reversed Name* field is an editable text field that allows the specification of a reversed name for an aggregation or association.

This field is only available when an aggregation or association line is selected.

The Arrow Buttons

Each of these two buttons toggle an option that shows or hides the optional arrow defining the direction of the name attribute or the reversed name attribute, respectively.

The direction and position of the arrow will be automatically calculated from the position and size of the associated name attribute as well as the direction of the line.

Typically it is desirable to use arrows to enhance clarity when defining both name and reversed name fields.

These buttons are only available when an aggregation or association line is selected.

The Role Name Fields

The *Role Name* fields are editable text fields that allow you to create and edit the role attributes belonging to each end of the association or aggregation.

These fields are only available when an aggregation or association line is selected.

The Role Multiplicity Fields

The *Role Multiplicity* fields are editable text fields that allow you to create and edit the multiplicity attributes of each end of an association or aggregation.

The name field is only available when an aggregation or association line is selected.

The Ordered Buttons

Selecting the *Ordered* toggle creates an uneditable text attribute containing the text “{ordered}”. Deselecting the *Ordered* toggle removes this text attribute.

The ordered text attribute can be specified both in the primary and the reverse direction.

These buttons are only available when an aggregation or association line is selected.

The *Sorted* Buttons

Selecting the *Sorted* toggle creates an uneditable text attribute containing the text “{sorted}”. Deselecting the *Sorted* toggle removes this text attribute.

The sorted text attribute can be specified both in the primary and the reverse direction.

These buttons are only available when an aggregation or association line is selected.

The *Qualifiers* Fields

The *Qualifiers* fields are editable text fields that allow you to create and edit the qualifier fields in the forward and reverse direction respectively.

These fields are only available when an aggregation or association line is selected.

The *Derived* Button

The *Derived* button is a toggle option that indicates whether the selected association or aggregation should be marked as derived, i.e. crossed by a small slanting line.

This button is only available when an association line is selected.

The *Composite* Button

The *Composite* button is a toggle option that indicates whether the selected aggregation should be marked as composite, i.e. the diamond shape of the aggregation line should be filled.

This button is only available when an aggregation line is selected.

The *Constraint* Field

The *Constraint* field is an editable text field that allows you to create and edit the constraint line attribute object.

This field is only available when an association or aggregation line is selected.

The *Close* Button

The *Close* button closes the Line Details window.

Symbol Details Window

The Symbol Details window is opened when you select *Symbol Details* from the *Edit* menu. It is used to inspect, and edit the stereotype and properties fields of the currently selected class or object symbol. These two symbol attribute types can only be created from the Symbol Details window. However, when created they can be edited directly in the diagram.

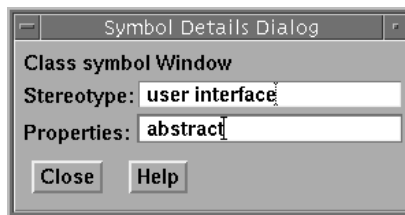


Figure 303: The Symbol Details dialog

Changes made in the Symbol Details window will take immediate effect and will be shown in the drawing area. These changes can be undone with the *Undo* menu command.

Unlike the Browse & Edit Class dialog, the Symbol Details window is modeless and can remain open while you continue to work with the diagrams. The contents of the window will be updated to reflect the current selection. If multiple class or object symbols or any other symbol or line is selected the Symbol Details window will be dimmed.

The placement of the stereotype and properties texts in the class and object symbol is described in [“Class Symbols” on page 1594](#).



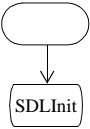
SC Editor Specific Information

Converting State Charts to SDL





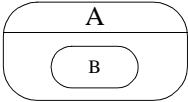
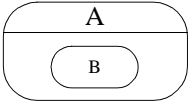
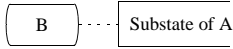
To convert state charts to SDL, you select *Convert SC to SDL* from the *Tools* Menu.

Following are the transformation rules that are applied to the SC diagram:

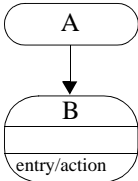
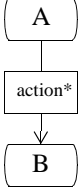
Transformation Rules for Diagrams and Symbols

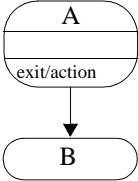
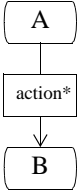
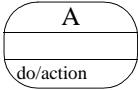
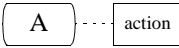
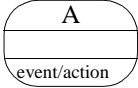
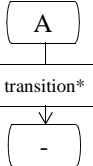
SC	SDL
SC diagram	Process diagram
“Heading”	Process “Heading”
Text symbol	Text symbol
Start symbol  Note: This rule does not apply if the start symbol belongs to a hierarchical state. If an event is defined on the transition from this state or if more than one transition from this state:	Start symbol  Start symbol connected to ‘initial’ state symbol named SDLInit. 

SC Editor Specific Information

SC	SDL
Termination symbol  Note: 1. This rule does not apply if the termination symbol belongs to a hierarchical state. 2. If more than one transition to the termination symbol, the stop symbol is duplicated.	Stop symbol 
State symbol 	State symbol 
Hierarchical state symbol 	Nothing
Substate symbol 	State symbol with a comment symbol 

Transformation Rules for State Internal Activities

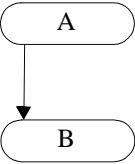
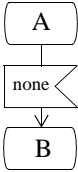
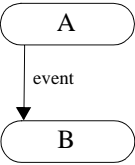
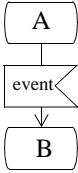
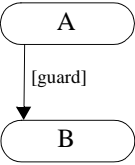
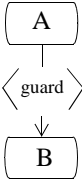
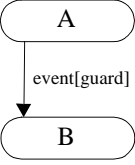
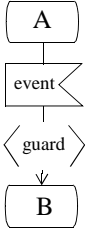
SC	SDL
For all transitions from A to B 	Add action symbol  <p><i>* See “Transformation Rules for Actions” on page 1666</i></p>

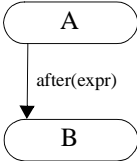
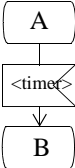
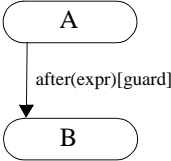
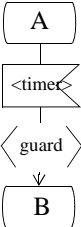
SC	SDL
<div>For all transitions from A to B</div> <div></div>	<div>Add action symbol</div> <div></div> <div>* See “Transformation Rules for Actions” on page 1666</div>
<div></div>	<div>Comment symbol</div> <div></div>
<div></div>	<div></div> <div>* See “Transformation Rules for Transitions” on page 1660</div>

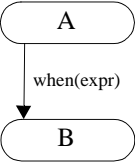
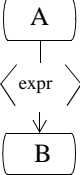
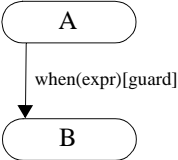
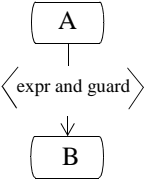
Transformation Rules for Transitions

If actions are specified in the transition labels, insert actions last in the generated transition.

SC Editor Specific Information

SC	SDL
 <pre> graph TD A([A]) --> B([B]) </pre>	<p>Spontaneous transition</p>  <pre> graph TD A[A] -- none --> B[B] </pre>
 <pre> graph TD A([A]) -- event --> B([B]) </pre>	 <pre> graph TD A[A] -- event --> B[B] </pre>
 <pre> graph TD A([A]) -- "[guard]" --> B([B]) </pre>	<p>Continuous signal</p>  <pre> graph TD A[A] -- "guard" --> B[B] </pre> <p>Note: Priority is required if more than one continuous signal exist from the same state. This must be manually added.</p>
 <pre> graph TD A([A]) -- "event[guard]" --> B([B]) </pre>	<p>Enabling condition</p>  <pre> graph TD A[A] -- event --> G["guard"] G --> B[B] </pre>

SC	SDL
 <pre>graph TD; A([A]) -- after(expr) --> B([B]);</pre>	<p>Timer with the name “<A>_T<counter>”, where <counter> is an integer.</p> <div><div>timer <timer> := expr;</div></div> <p>For all transitions to <A> add:</p> <div><div>set (<timer>)</div></div> <p>For this transition from <A>:</p>  <pre>graph TD; A[A] --> T[/<timer>/]; T --> B[B];</pre> <p>For all other transitions from <A> add:</p> <div><div>reset (<timer>)</div></div>
 <pre>graph TD; A([A]) -- after(expr)[guard] --> B([B]);</pre>	<p>As above, but add an enabling condition:</p>  <pre>graph TD; A[A] --> T[/<timer>/]; T --> G[/guard/]; G --> B[B];</pre>

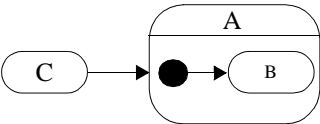
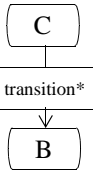
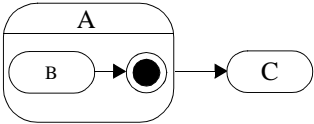
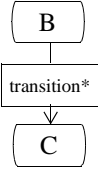
SC	SDL
 <pre> graph TD A([A]) -- "when(expr)" --> B([B]) </pre>	<p>Continuous signal</p>  <pre> graph TD A[A] -- "<expr>" --> B[B] </pre> <p>Note: Priority is required if more than one continuous signal exist from the same state. This must be manually added.</p>
 <pre> graph TD A([A]) -- "when(expr)[guard]" --> B([B]) </pre>	<p>Continuous signal</p>  <pre> graph TD A[A] -- "<expr and guard>" --> B[B] </pre> <p>Note: Priority is required if more than one continuous signal exist from the same state. This must be manually added.</p>

Transformation Rules for State Internal Activities on Hierarchical States

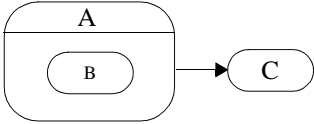
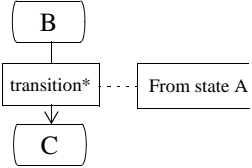
- An **Entry** action of a hierarchical state is always performed when one of its substates is entered from the outside. This is applied for any number of state boundaries crossed.
- An **Exit** action of a hierarchical state is always performed when one of its substates takes a transition to a state outside the substate region. This is applied for any number of state boundaries crossed.

- An **Event** action of a hierarchical state is applied to all of its sub-states, at any nesting depth, unless a transition with the same event exists on the substate.
- A **Do** action of a hierarchical state is applied to all of its substates, at any nesting depth.

Transformation Rules for Transitions on Hierarchical States

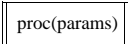
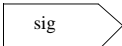
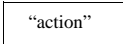
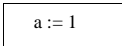
SC	SDL
<div></div> <div>Note: Exactly one start state, with an unlabeled transition, should exist in the hierarchical state.</div>	<div></div> <div>* See <u>“Transformation Rules for Transitions” on page 1660</u></div>
<div></div> <div>Note: An unlabeled transition should exist out from the hierarchical state.</div>	<div></div> <div>* See <u>“Transformation Rules for Transitions” on page 1660</u></div>

SC Editor Specific Information

SC	SDL
 <p>Note:</p> <ol style="list-style-type: none"> 1. This rule applies for every substate at any nesting depth. 2. Exception: This rule does not apply if a transition with the same trigger (event[guard]) exists on the substate. 	 <p>* See <u>“Transformation Rules for Transitions”</u> on page 1660</p>

Transformation Rules for Actions

Depending of text contents:

SC	SDL
If text starts with ‘call’: <i>call proc(params)</i>	Procedure call 
If text starts with ‘output’: <i>output sig</i>	Output 
If quoted text: <i>“action”</i>	Informal task 
Otherwise: <i>a := 1</i>	Task 

DP Editor Specific Information

Line Details Window

The Line Details window is opened when you select *Line Details* from the *Edit* menu. It is used to inspect, and edit the properties of the currently selected line. In particular, most of the line attribute objects that are available for the different line types can only be created from the Line Details window¹.

Some line attribute objects contain editable text, and clearing that text, whether by editing in the Line Details window or directly in the diagram, will remove the attribute.

Changes made in the Line Details window will take immediate effect and will be shown in the drawing area. These changes can be undone with the *Undo* menu command.

The Line Details window is modeless and can remain open while you continue to work with the diagrams. The contents of the window will be updated to reflect the current selection.

The DP Editor supports two different types of lines and the contents of the Line Details window depends on the type of the currently selected line:

- If an *Association* line is selected, the text fields for the name, protocol and encoding as well as the direction option menu in the Line Details window will be active. See [Figure 304](#).
- If an *Composite Aggregation* line is selected, only the multiplicity text field in the Line Details window will be active. See [Figure 305](#).
- If none or more than one line is selected, all items in the Line Details window will be dimmed.

1. Once created, however, all editable textual line attribute objects can be selected and edited directly in the diagram, without the use of the Line Details window.

The screenshot shows a window titled "DPE Line Details - my_application/1". The main heading is "Association from client to server". Below this, there are several fields: "Name:" followed by an empty text box, "Direction:" with a dropdown menu showing "From server", and "Protocol:" with a text box containing "TCP/IP". There are two columns of fields for "Forward:" and "Reverse:" properties. Each column has "Role:" and "Multiplicity:" text boxes, followed by checkboxes for "Ordered" and "Sorted". Below these is a "Qualifiers:" text box. A section for "Encoding:" contains a text box with "BER" and checkboxes for "Derived" and "Composite aggregate". At the bottom are "Close" and "Help" buttons.

Figure 304: The Line Details window when an association line is selected

The screenshot shows a window titled "DPE Line Details - my_application/1". The main heading is "Aggregation from client to GUI". Below this, there are several fields: "Name:" followed by an empty text box, "Direction:" with a dropdown menu showing "None", and "Stereotype:" with an empty text box. There are two columns of fields for "Forward:" and "Reverse:" properties. Each column has "Role:" and "Multiplicity:" text boxes, followed by checkboxes for "Ordered" and "Sorted". Below these is a "Qualifiers:" text box. A section for "Properties:" contains an empty text box and checkboxes for "Derived" and "Composite aggregate". At the bottom are "Close" and "Help" buttons.

Figure 305: The Line Details window when an aggregation line is selected

The Name Field

The *Name* field is an editable text field that contains the name of the selected association.

This field is only available when an association line is selected.

The *Direction* Option Menu

By selecting one of the predefined values in the direction option menu the direction attribute of the currently selected association can be set. If any other value than None is selected an arrow will appear at one of the ends of the association line.

This option menu is only available when an association line is selected.

The *Protocol* Field

The *Protocol* field is an editable text field that allows you to create and edit the protocol attribute of an association.

The protocol field is only available when an association line is selected.

For an association line the line attribute object defined by the protocol field is permanent and is not destroyed even if the protocol field is cleared. In this respect it differs from most of the other text fields in the Line Details window.

The *Encoding* Field

The *Encoding* field is an editable text field that allows you to create and edit the encoding attribute of an association.

The encoding field is only available when an association line is selected.

The *Multiplicity* Field

The *Multiplicity* field is an editable text field that allows you to create and edit the multiplicity attribute of an aggregation.

The multiplicity field is only available when an aggregation line is selected.

For an aggregation line the line attribute object defined by the multiplicity field is permanent and is not destroyed even if the multiplicity field is cleared. In this respect it differs from most of the other text fields in the Line Details window.

The *Composite aggregate* Button

The *Composite aggregate* button is a toggle option that indicates that the selected aggregation is a composite aggregation, i.e. the diamond shape of the aggregation line is filled.

This button is set automatically depending on the current selection and is therefore never available.

The *Close* Button

The *Close* button closes the Line Details window.

Symbol Details Window

The Symbol Details window is opened when you select *Symbol Details* from the *Edit* menu. It is used to inspect, and edit the stereotype and properties fields of the currently selected node, component, thread or object symbol. For the component symbol the integration model can be selected. For the thread symbol you can edit thread priority, stack size, queue size and max signal size. For the object symbol you can enter a qualifier. These symbol attribute types can only be created from the Symbol Details window. However, when created the stereotype and properties texts can be edited directly in the diagram. All other settings can only be inspected and edited in the Symbol Details window.

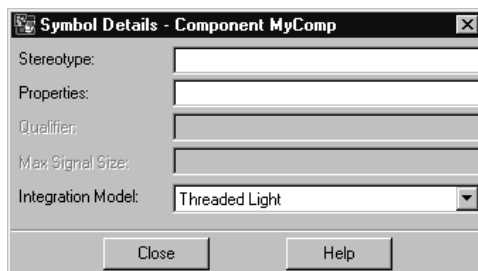


Figure 306: The Symbol Details dialog

Changes made in the Symbol Details window will take immediate effect and will be shown in the drawing area. These changes can be undone with the *Undo* menu command.

The Symbol Details window is modeless and can remain open while you continue to work with the diagrams. The contents of the window will be updated to reflect the current selection. If multiple symbols or a line is selected the Symbol Details window will be dimmed.

Generating a Partitioning Diagram Model

The Partitioning Diagram Model is used by the Targeting Expert as an hierarchical overview of the entities that are to be built. Partitioning Diagram Models can be generated from Deployment Diagrams. More information about this can be found in [chapter 41, *The Deployment Editor, in the User's Manual*](#). That chapter contains guidelines for modeling Deployment Diagrams that can be used for targeting, as well as information on the available integration models.

You generate Partitioning Diagram Models from the Organizer by selecting a Deployment diagram and then selecting “Targeting Expert” in the pop-up menu. You can also select “Targeting Expert” from the Generate menu. If the generation is successful the Targeting Expert is launched with the Partitioning Diagram Model as input.

Mapping Rules

Associations are ignored in Partitioning Diagram Model generation.

The stereotype “external” on a component or node symbol means that the symbol and its sub-tree are not included when the Partitioning Diagram Model is generated. This makes it possible to model the environment that surrounds an SDL system in a deployment diagram.

Graphical Syntax Rules

In order to generate a valid Partitioning Diagram Model that can be used by the Targeting Expert the rules listed below have to be followed:

- A valid diagram contains at least one node, one component and one object, which are connected.
- at least one component must belong to each node
- at least one thread or one object must belong to each component
- at least one object must belong to each thread
- every symbol must have a name
- names of nodes must be unique within the diagram
- names of components must be unique within their node

- names of threads must be unique within their component
- each thread must be connected to exactly one component
- each object must be connect to one component or one thread

Object symbols

For object symbols several text attributes have to be correct in order to result in valid Partitioning Diagram Models.

The name of each object symbol in the diagram should be the name of the corresponding SDL entity. Whether it is a system, block or process should be specified by the stereotype and the qualifier text should describe how the SDL entity fits into the tree structure of the SDL system.

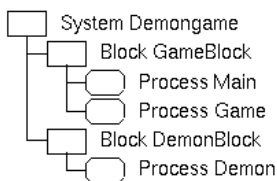


Figure 307: The tree structure of the system Demongame

Figure 307 shows the system Demongame. An object representing the process Main in a deployment diagram should have the following text attributes:

- qualifier: **Demongame/GameBlock/Main**
- stereotype: **process**
- name: **Main**

In the same way an object representing the system Demongame should have **Demongame** as qualifier text, the stereotype **system** and the name **Demongame**.

MSC Editor Specific Information

Pasting in MSC Diagrams

To paste, you select *Paste* from the Edit Menu. The rules for *Paste* will be described below.

When pasting the selection, the MSC Editor will process each individual object contained in the selection, adjust it to the grids if required and connect it, if feasible, to the “closest” object(s) in the drawing area.

If the MSC Editor fails in pasting some of the objects contained in the selection, the rest of the objects will nevertheless be pasted but without an error message being displayed.

Pasting of Multiple Objects

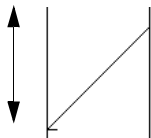
When pasting a selection that consists of multiple objects, the MSC Editor attempts, as long as feasible, to preserve the original appearance of the selection.

Pasting of Individual Objects

When pasting individual objects, the MSC Editor processes the objects as follows:

- Text
A text symbol may be pasted anywhere.
- Comment
A comment symbol may be pasted anywhere. The line connecting the comment symbol to another symbol is however lost when pasting.
- Instance head / Instance axis
The instance head and its axis may be pasted anywhere.
- Instance end and Stop
An instance end or stop may only be pasted at a location where it overlaps an instance axis.

“height”
of an object



- Message
A message is connected to the instance axes which are closest to the message's base and end point, preserving the direction and “height” of the message.
- Message-to-self
A message-to-self is connected to the closest instance axis. The “height” of the message is preserved.
- Condition and MSC Reference
A condition or an MSC reference is connected to the instance it was previously connected to (before copying it to the clipboard).
- Timer
A timer is connected to the closest instance axis. The “height” of the timer is preserved (see Message above).
- Action
An action is pasted on the closest instance axis.
- Create
The create symbol may be pasted anywhere, but only together with the instance it is creating.
- Coregion
A coregion is connected to the closest instance axis, to the left or right. The “height” of the coregion is preserved (see Message above).

Adding Symbols

Adding an Instance Head Symbol

When you add an instance head symbol, an instance axis line is drawn that connects the symbol to the bottom of the drawing area. The instance axis line cannot be drawn manually. It will be truncated or elongated when you add or move an instance end or stop symbol upwards or downwards. See “Adding an Instance End Symbol” on page 1742 in chapter 42, *Editing MSC Diagrams* and “Adding a Stop Symbol” on page 1743 in chapter 42, *Editing MSC Diagrams*.

The instance head symbol has three text fields:

- The instance name field
- The instance kind field
- The decomposition field. See [Figure 308](#).

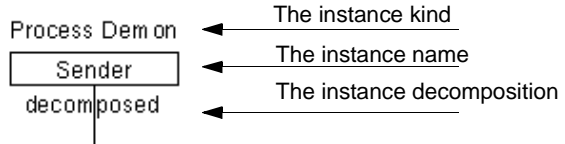


Figure 308: The meaning of the instance head text fields

The ITU recommendation Z.120 discusses several ways of using the instance name and instance kind text fields. In the MSC Editor, the text fields are used as follows:

- Basically, the *instance kind* reflects what kind of instance is represented. That is, an identifier which reflects the name of the corresponding SDL block/service/process/procedure; and an optional identifier which identifies if it is a block, a service or a process (the *kind denominator*).
- The *instance name* reflects the current function of the instance.
- The *instance decomposition* shows if the instance is in turn decomposed as a sub MSC. This text field is by default empty, but can contain the text *decomposed* or *decomposed as <diagram name>* to indicate that the instance is in turn decomposed. To decompose an instance, you select *Decompose* from the *Edit* menu.

Adding a Condition, MSC Reference or Inline Expression Symbol

A *condition* or *MSC reference* describes either a global system state referring to all instances contained in the MSC or a state referring to a subset of instances (a non-global condition or MSC reference). The minimum subset is a single instance.

For two MSCs, the second is a continuation of the first if its initial global condition is identical to the final global condition of the first. Identifying an intermediate global condition can be used when breaking down an MSC into two parts.

By means of non-global conditions, combinations of MSCs with different sets of instances can also be defined. The continuation then refers only to the common subset of instances.

The following general rule applies to the continuation of two MSCs (MSC1 and MSC2, with a non-empty common set of instances).

MSC2 is a continuation of MSC1 if, for each instance which both MSCs have in common:

- MSC1 ends with a (non)global condition
- MSC2 begins with a corresponding¹ (non)global condition
- Each (non)global condition of MSC2 has a corresponding (non)global condition in MSC1.

An *inline expression* symbol is always global and connected to all instances. The inline expression symbol is created from two inline expression symbol parts:

- The inline expression symbol starts a new inline expression symbol. The inline expression text in this symbol determines the inline expression type:
 - The keyword **loop** identifies a loop. Example: “LOOP <1, 5>” means that the contents of the inline expression symbol will be executed between one and five times.
 - The keyword **opt** identifies an optional part. The contents of the inline expression symbol will either not be executed or executed once.
 - The keyword **exc** identifies an exceptional part. The contents of the inline expression symbol will either not be executed or executed once. If it is executed, then the rest of the MSC is skipped.
 - The keyword **par** identifies parts that are executed in parallel.
 - The keyword **alt** identifies alternative parts. Only one part will be executed.
- The inline expression separator symbol starts a new part in a parallel or alternative inline expression.

1. *Corresponding* in this context means that both conditions refer to the same subset of instances and both conditions agree with respect to name.

Displaying and Modifying Status

To display and modify status, you select Status from the *Edit* menu.

Timer Status

Z.120 specifies two appearances for the timer symbol, depending on whether the timer has expired (i.e. time-out) or whether the timer is re-set. The appearance of the timer is illustrated in [Figure 309](#).

- **Timeout** – A timer expires.
- **Reset** – The timer is stopped.
- **Implicit reset** – Assigned a new value while active.



Figure 309: Timer status

Separate Timer Status

Separate timer symbols has no need for an implicit reset. The timer can be set two times in a row without an implicit reset in-between.

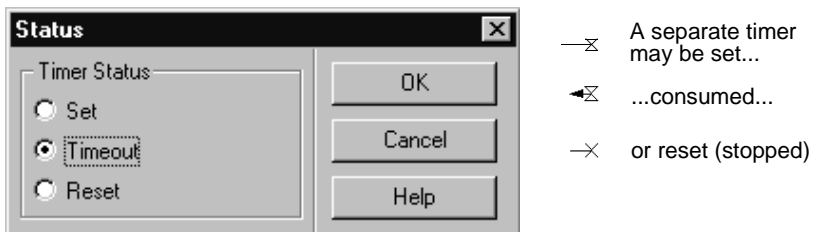


Figure 310: Separate Timer status

Displaying Information About the Selected MSC Object

To display information about a selected MSC object, you select *Info Window* from the *Window* menu.

This opens a dialog displaying additional information about the currently selected MSC object. The information that is available depends on what object is selected, and this is described in the table below.

Selected Object	Information Available
Instance head	<ul style="list-style-type: none">• Instance name• Instance kind• Composition• Creating instance
Instance end	<ul style="list-style-type: none">• Instance kind
Stop	<ul style="list-style-type: none">• Instance kind
Process create	<ul style="list-style-type: none">• Creating instance• Created instance• When the instance was created^a• SDL Reference^a
Message output (the message output is selected by clicking close to the message base)	<ul style="list-style-type: none">• Message name• Sending instance• Receiving instance• Message status =<ul style="list-style-type: none">– Sent^b– Consumed^c• When the message was sent (now)^a• Message parameters• SDL Reference^a

MSC Editor Specific Information

Selected Object	Information Available
Message input (the message input is selected by clicking close to the message end)	<ul style="list-style-type: none">• Message name• Sending instance• Receiving instance• Message status=<ul style="list-style-type: none">– Sent^b– Consumed^c• When the message was consumed• Message parameters• SDL Reference^a
Timer	<ul style="list-style-type: none">• Timer name• Instance kind• Timer status=<ul style="list-style-type: none">– Reset (stopped)– Implicit reset– Timeout• When the message was sent (now)^a• Timer value (Set)• Timer parameters• SDL Reference^a
Separate timer	<ul style="list-style-type: none">• Timer name• Instance kind• Timer status=<ul style="list-style-type: none">– Set– Reset (stopped)– Timeout• When the message was consumed (now)^a• Timer parameters• SDL Reference^a
Action symbol	<ul style="list-style-type: none">• Instance kind• Action text• SDL Reference^a
Condition	<ul style="list-style-type: none">• Condition or MSC reference name• Instances connected to the condition• SDL Reference^a

Selected Object	Information Available
MSC Reference symbol	<ul style="list-style-type: none">• Condition or MSC reference name• Instances connected to the condition
Text symbol	<ul style="list-style-type: none">• Symbol text
Comment symbol	<ul style="list-style-type: none">• Symbol text
Inline symbol	<ul style="list-style-type: none">• Instances connected• Operator (inline expression)

- Only for diagrams created through a simulation.
- A message is *sent* when it has been sent and received, but has not yet been *consumed* by the receiving instance. Typically, it is waiting in the receiving process input queue.
- A message is *consumed* when it has been processed by the receiving instance.

Instance Ruler

When managing working on a long (vertically extended) MSC, the *kind* of instance in the *instance head* may not be visible in the drawing area.

The *instance ruler* (illustrated in [Figure 311](#)) shows the kind of the instance heads that are not currently visible in the drawing area. It reduces the amount of scrolling up or down when working on an MSC. The instance ruler may be shown or hidden with an option (see [“Instance Ruler” on page 1632](#)).

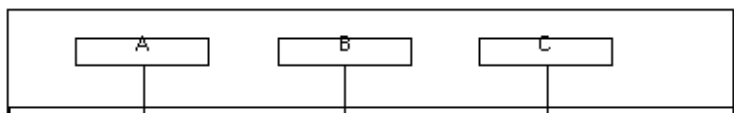


Figure 311: The instance ruler

Tracing a Simulation in a Message Sequence Chart

This section describes the functionality behind tracing a simulation in an MSC.

General

The MSC Editor may be used as a graphical trace tool, which features the automatic generation of an MSC from a simulation.

- The results of the simulation may be presented on line in an MSC Editor window, in which each event of interest will be appended to the chart in order to build up an MSC which reflects the history of the simulation.
- It is also possible to run the simulation, save the results on a simulator MSC log file and open the file from the MSC Editor.
- The commands that start up the logging of MSC events, set up the scope of trace, stop the logging of events, and so on, are given to the simulator monitor. See [chapter 51, *Simulating a System*](#).

Defining the Scope of Trace

First, the scope of trace should, if necessary, be set to the unit which is currently of interest. This is done with the command [Set-MSC-Trace](#).

The graphical trace is then started with a dedicated command from the simulator monitor. See [“*Start-Interactive-MSC-Log*” on page 2110 in chapter 50, *The SDL Simulator*](#). In response to this command, the following happens:

1. In the Organizer, a reference to an MSC is added. The diagram is assigned an unique name.
2. An instance of the MSC Editor window is activated on the newly created MSC.
3. The current status for the simulation is presented by displaying all SDL process instances that exist at the time when ordering the command [Start-Interactive-MSC-Log](#).

Mapping Between SDL and MSC

The mapping rules which govern how SDL events are transformed into MSC symbols, lines and textual elements are summarized in the following table:

SDL concept	MSC Concept
Signal <ul style="list-style-type: none"> • Output • Input 	Message <ul style="list-style-type: none"> • Sending • Consumption
Signal to self <ul style="list-style-type: none"> • Output • Input 	Message to self <ul style="list-style-type: none"> • Sending • Consumption
Timer <ul style="list-style-type: none"> • Set • Reset • Implicit Reset • Input 	Timer <ul style="list-style-type: none"> • Set • Reset • Implicit reset^a • Time-out
Create a process	Process Create
Stop a process	Stop
Environment	Environment ^b
System <system name>	Instance <instance kind>
Substructure <system name>	Instance <instance kind>
Block <block name>	Instance <instance kind>
Process <process name> <instance number>	Instance <instance kind> <instance name>
State	Condition ^c
Task	Action ^d
Comment	Comment

- a. See [“Implicit reset” on page 1685](#).
- b. The system’s environment is denoted by `env_1`
- c. The mapping is only completely valid for a condition connected to only one instance. A condition connected to several instances expresses a logical AND-combination of the states of the processes corresponding to those instances.
- d. The *action* symbol corresponds to a task symbol containing informal text. This translation is, however, not supported when generating an MSC from a simulation.

Generating the MSC

When running the simulation, each SDL event of interest (in the scope of MSC Trace) that takes place will cause the corresponding MSC symbol to be drawn in the drawing area of the MSC Editor.

Drawing Conventions

Layout

Default layouting algorithms are used. Each event causes the insertion point to be translated downwards with one vertical spacing unit, keeping the intuitive feeling of **absolute order** between events. An event could be, for instance, the output or the input of an SDL signal. However, if an output event is immediately followed by an input event, no translation will take place.

Auto-Resizing of MSC

The MSC Editor will automatically enlarge the MSC size when the MSC has grown so that it reaches the bottom or right of the drawing area. The MSC is enlarged according to a preference parameter.

Messages

A distinction is made between the *reception* and the *consumption* of messages:

- **Reception** of a message: Once an SDL signal is output in the simulator, it is immediately placed into the input port of the receiving process instance. There may, however, be other pending SDL signals in this queue, which means that the signal might not be input immediately. Therefore, when a signal is output, it is illustrated as a

lost message, marked at its end with the name of the receiving instance, from the *sending instance* to the *receiving instance*.

- **Consumption** of a message: When an SDL signal is input, the vertical position for the next event may have moved down in comparison to the position of the signal output. An input of a signal is illustrated by redrawing the line representing the message with its end point connected to the new vertical position. (If an output event is immediately followed by an input, there is no change in vertical position.)
- In the case messages remain lost for a “long” time, this may be interpreted as some kind of erroneous behavior which requires special attention. Messages that are never consumed indicate that some design error might have been introduced in the SDL system. It is up to you to decide whether the time which has elapsed since a message was sent should be considered as exceeding a reasonable value.

Create of Process

Each time an SDL process is dynamically created, a process create will be drawn from the source instance axis, and the created instance will be positioned according to the insert and grouping modes that is set. This guarantees that no overlapping instance axes will take place.

The MSC Editor will automatically enlarge the MSC size when the MSC has grown so that it reaches the bottom or right of the drawing area. The drawing area is enlarged according to the value of a preference parameter.

Process Stop

If an instance is stopped (by a stop symbol), the space which becomes available beneath the instance end symbol will not be reused for new instance axes.

Timers

- The MSC Editor can handle four different timer statuses resulting from a simulation:
 - *Set*
 - *Reset (stopped)*
 - *Implicit reset*
 - *Timeout*

On the MSC they are shown according the figure below:

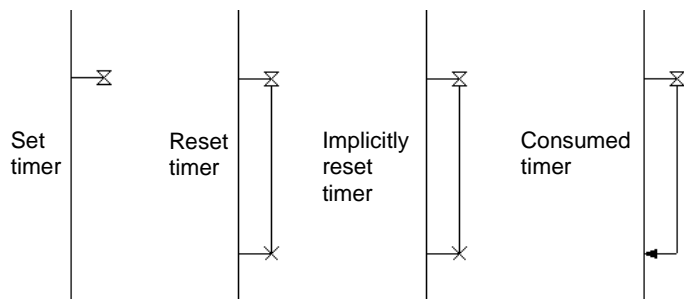


Figure 312: Timer status as shown on the MSC

- *Implicit reset*

The *implicit reset* timer status is a non-Z.120 addition to the MSC Editor. An implicitly reset timer is immediately set again to its original parameters after reset. It is illustrated in the same way as a *reset* timer, but the status information is reflected in the *Info* dialog (see [“Requesting Detailed Information on an Object”](#) on page 1737).

Instances

- **The Environment Instance**

All interchange of information between the SDL system and its environment is displayed by sending / receiving messages to or from an instance with the name `env_1`. This instance is normally placed at the left of the drawing area.

- **The Void Instance**

Graphically, in the Message Chart Editor, the concept *conditional trace* (see “*Scope of Trace for Generation of Message Sequence Charts*” on page 2119 in chapter 50, *The SDL Simulator*) is illustrated as sending or receiving messages to / from an *instance* with the name *Void*. The purpose of the *Void* instance is to document that a message exchange actually took place without focusing on the sending / receiving instance.

- **The Instance Name and Instance Kind Text Fields**

The ITU recommendation Z.120 allows several ways of using the two text fields *Instance Name* and *Instance Kind*. This was discussed earlier in “*Adding an Instance Head Symbol*” on page 1741 in chapter 42, *Editing MSC Diagrams*.

When generating an MSC, the *SDL Process Name* and the internal *instance number* managed by the simulator monitor are concatenated to build up one (MSC) *Instance Name*. The *SDL diagram type* and *diagram name* are concatenated to build one *Instance Kind*.

Example 298 Instance Name and Instance Kind in Simulation Trace

Assume the simulation program contains an instance of the SDL diagram type = *process* with the *diagram name* = *Demon* and monitor *instance number* = 2 This would be displayed as the following instance:

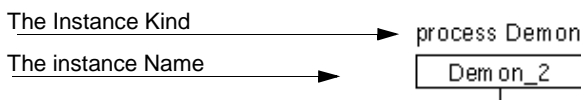


Figure 313: The use of the instance text fields in a simulation

Terminating the Trace

Having terminated the trace (either by stopping the simulation or turning the MSC trace off), **you are responsible for saving** the MSC(s) that are the results of the simulation.

Syntax Summary

Object Model Syntax

While the intent of Object Model diagrams is to give as large flexibility as possible to analysis and specification activities, the different editing support facilities provided by the OM Editor requires textual data to follow certain syntactic conventions.

This section details the syntax rules that are imposed by the OM Editor on textual data only. Graphical syntax rules are enforced automatically by the OM Editor and are not described here.

Summary of Lexical Rules

In general, a somewhat restricted version of the lexical rules of SDL apply for names. These rules have the following noteworthy properties:

- It is possible to break a name over more than one line by using the underscore at the end of the line to escape the newline.
- It is possible to have identifiers consisting entirely of numeric characters; e.g. “223” is a valid identifier.
- Identifiers are not case sensitive.
- Comments can be used anywhere in the texts. A comment is defined as an SDL comment, i.e. `/* this is a comment */`

For more information on the SDL lexical rules, see the Z.100 recommendation.

The primary restriction is that identifiers containing spaces are not considered legal.

```
<name> ::= identifier as described above.  
<c-string> ::= string as bounded by " characters.  
<sdl-string> ::= string delimited by '  
(apostrophes).
```

Class Definition Summary

When interpreting OM diagrams, all class and object symbols within all pages within all diagrams in a single module must be considered. A class definition is considered to be the conceptual union of the informa-

tion contained in all class symbols with the same name, as well as all object symbols declared as instances of that class.

This means that the definition of a class can be distributed over several symbols, pages and even diagrams. The definitions in class symbols with the same name are then merged to obtain the complete definition of the class; support for this is provided by the *Browse & Edit Class* dialog.

Thus, when defining classes, it is acceptable to have identical attributes or operations defined several times, either in the same or different class or object symbols. The identical definitions are simply redundant, and do not affect the correctness of the complete class definition.

Note, however, that each unnamed class objects is considered distinct, so that each unnamed class symbol defines its own class.

Diagram Name Syntax

Diagram names must follow certain restrictions since they are used to identify the diagram with respect to other tools.

```
Diagramname ::= <name>
```

Page Name Syntax

```
Pagename ::= <name>
```

Each page name must be unique within its containing diagram.

Class Symbol Syntax

The textual information in class symbols is divided into five compartments of which three have their own syntax. The stereotype and properties compartments are not checked for syntax.

In the attributes and operation compartments the *stereotype concept* as described in “[Object Model Literature References](#)” on page 1702 can be used. The syntax chosen supports the single characters left/right guillemot («») but it can also be written as two angle brackets. To type the left/right guillemot in the text window, press <Ctrl> when you type the left/right angle bracket.

Class Name Compartment Syntax

```
Classname ::= <name> |  
            <name> ':' ':' <name> |  
            <empty>
```

Class Attributes Compartment Syntax

```
ClassAttributesCompartment ::=  
    { <stereotype> <classattribute> <note> }*  
<stereotype> ::= '<' '<' <name> '>' '>' |  
                '«' <name> '»' |  
                <empty>  
<classattribute> ::=  
    <visibility> <attribute>  
<visibility> ::=  
    '+' |  
    '-' |  
    '#' |  
    <empty>  
<attribute> ::=  
    <name> <value> |  
    <name> ':' <type> <value>  
<type> ::= <name>  
<value> ::= '=' <valueitem> | <empty>  
  
<valueitem> ::=  
    <name> |  
    '-' <name> |  
    '+' <name> |  
    <c-string> |  
    <sdl-string> |  
    '(' <valueitemlist> ')' |  
    '{' <valueitemlist> '}'  
<valueitemlist> ::=  
    <valueitem> |  
    <valueitemlist> ',' <valueitem>  
<note> ::=  
    '{' <name> '}' |  
    '{' <name> '=' <name> '}' |  
    <empty>
```

Two attributes are considered identical if they have the same name and type. Note that attributes defining different values are still considered identical.

Class Operations Compartment Syntax

```
ClassOperationsCompartment ::=  
    { <stereotype> <classoperation> <note> }*  
<classoperation> ::=  
    <visibility> <operation>  
<operation> ::=  
    <name> <return> |  
    <name> '(' ')' <return> |  
    <name> '(' <parameterlist> ')' <return>
```

```

<parameterlist> ::=
  parameter |
  parameterlist ',' parameter
<parameter> ::=
  <type> |
  <name> ':' <type>
<return> ::=
  ':' <name> |
  <empty>

```

Two operations are considered identical only if the name, parameter list and the return fields are all the same. Thus “op”, “op(a)” and “op:t” are all unequal, while “op(a)”, “OP(A)” define the same operation.

Note however that “op” and “op()” are not considered equal, since the OM Editor does not interpret an omitted parameter list as an empty parameter list.

Object Symbol Syntax

The textual information in object symbols is divided into four compartments of which two have their own syntax. The stereotype and properties compartments are not checked for syntax.

Object Name Compartment Syntax

```

Objectname ::=
  <name> ':' <classname> |
  <name> |
  <empty>

```

Object Attributes Compartment Syntax

```

ObjectAttributesCompartment ::=
  { <stereotype> <attribute> <note> }*

```

Text Symbol Syntax

Text symbols are not subject to any syntax rules.

Line Syntax

The current version of the OM Editor does not implement any syntax checks on the contents of the textual attribute objects of lines.

State Chart Syntax

While the intent of State Chart diagrams is to give as large flexibility as possible to analysis and specification activities, the different editing support facilities provided by the SC Editor requires textual data to follow certain syntactic conventions.

This section details the syntax rules that are imposed by the SC Editor on textual data only. Graphical syntax rules are enforced automatically by the SC Editor and are not described here.

Summary of Lexical Rules

In general, a somewhat restricted version of the lexical rules of SDL apply for names. These rules have the following noteworthy properties:

- It is possible to break a name over more than one line by using the underscore at the end of the line to escape the new line.
- It is possible to have identifiers consisting entirely of numeric characters; e.g. “223” is a valid identifier.
- Identifiers are not case sensitive.
- Comments can be used anywhere in the texts. A comment is defined as an SDL comment, i.e. `/* this is a comment */`

For more information on the SDL lexical rules, see the Z.100 recommendation.

The primary restriction is that identifiers containing spaces are not considered legal.

```
<name> ::= identifier as described above.
```

State Definition Summary

UML allows some expressions in text segments to be defined by the tool vendors. For State Charts such expressions should follow SDL/PR syntax, but this is not checked by the SC Editor.

When interpreting SC diagrams, all state symbols within all pages within all diagrams in a single module must be considered. A state definition is considered to be the conceptual union of the information contained in all state symbols with the same name.

This means that the definition of a state can be distributed over several symbols, pages and even diagrams. The definitions in state symbols with the same name are then merged to obtain the complete definition of the state.

Thus, when defining states, it is acceptable to have identical activities defined several times, either in the same or different state symbols. The identical definitions are simply redundant, and do not affect the correctness of the complete state definition.

Note, however, that each unnamed state object is considered distinct, so that each unnamed state symbol defines its own state.

Diagram Name Syntax

The diagram name identifies the diagram.

```
<DiagramName> ::= <name>
```

Page Name Syntax

The page name identifies the page within a diagram.

```
<PageName> ::= <name>
```

Each page name must be unique within its containing diagram.

State Symbol Syntax

The textual information in state symbols' state sections is divided into three compartments with different syntax.

Name Compartment Syntax

The name identifies the state.

```
<NameCompartment> ::=  
    [<name>]
```

Internal Activity Compartment Syntax

Internal activities' syntax is defined by the following grammar:

```
<InternalActivityCompartment> ::=  
    {<internal-activity>}*  
  
<internal-activity> ::=  
    <event-signature>  
    [<guard-condition>]
```

```
[ '/' <action-expr> ]
|
<reserved-action-label> '/' <action-expr>

<reserved-action-label> ::=
    'entry' | 'exit' | 'do'

<event-signature> ::=
    <name> [<argument-list>] |
    <predefined-event> '(' <argument> ')'

<predefined-event> ::=
    'when' | 'after'

<argument-list> ::=
    '(' [<argument> {',' <argument>}* ] ')'

<argument> ::=
    <expression>

<guard-condition> ::=
    '[' <expression> ']'

<action-expr> ::=
    <expression>

<expression> ::=
    SDL/PR expression
```

Two events are considered identical only if the name and the argument list are all the same. Thus “op” and “op(a)” are unequal, while “op(a)”, “OP(A)” define the same event.

Note however that “op” and “op()” are not considered equal, since the SC Editor does not interpret an omitted parameter list as an empty parameter list.

Text Symbol Syntax

Text symbols are not subject to any syntax rules.

Transition Line Syntax

The textual information in the *transition label* attribute of transition lines is defined by the following grammar:

```
<TransitionLabel> ::=
    [<event-signature>]
    [<guard-condition>]
    [<action-list>]
```

```
<action-list> ::=  
    '/' <action-expr> { ';' <action-expr> } *
```

DP Syntax

While the intent of Deployment diagrams is to give as large flexibility as possible to analysis and specification activities, the different editing support facilities provided by the DP Editor require textual data to follow certain syntactic conventions.

This section details the syntax rules that are imposed by the DP Editor on textual data only. Graphical syntax rules are enforced automatically by the DP Editor and are not described here.

Summary of Lexical Rules

In general, a somewhat restricted version of the lexical rules of SDL apply for names. These rules have the following noteworthy properties:

- It is possible to break a name over more than one line by using the underscore at the end of the line to escape the newline.
- It is possible to have identifiers consisting entirely of numeric characters; e.g. “223” is a valid identifier.
- Identifiers are not case sensitive.
- Comments can be used anywhere in the texts. A comment is defined as an SDL comment, i.e. `/* this is a comment */`

For more information on the SDL lexical rules, see the Z.100 recommendation.

The primary restriction is that identifiers containing spaces are not considered legal.

```
<name> ::= identifier as described above.
```

Diagram Name Syntax

The diagram name identifies the diagram.

```
<DiagramName> ::= <name>
```

Node Symbol Syntax

The name identifies the node.

$$\langle \text{NodeName} \rangle ::= \langle \text{name} \rangle \mid \langle \text{empty} \rangle$$

There are no syntax checks on the stereotype and properties texts.

Component Symbol Syntax

The name identifies the component.

$$\langle \text{ComponentName} \rangle ::= \langle \text{name} \rangle \mid \langle \text{empty} \rangle$$

There are no syntax checks on the stereotype and properties texts.

Thread Symbol Syntax

The name identifies the thread.

$$\langle \text{ThreadName} \rangle ::= \langle \text{name} \rangle \mid \langle \text{empty} \rangle$$

Object Symbol Syntax

The name identifies the object.

$$\langle \text{ObjectName} \rangle ::= \langle \text{name} \rangle \mid \langle \text{empty} \rangle$$

There are no syntax checks on the stereotype, properties and qualifier texts.

Text Symbol Syntax

Text symbols are not subject to any syntax rules.

Line Syntax

The DP Editor does not implement any syntax checks on the contents of the textual attribute objects of lines.

HMSC Syntax

While the intent of High level MSC diagrams is to give as large flexibility as possible to analysis and specification activities, the different editing support facilities provided by the HMSC Editor requires textual data to follow certain syntactic conventions as specified in MSC'96.

This section details the syntax rules that are imposed by the HMSC Editor on textual data only. Graphical syntax rules¹ are enforced automatically by the HMSC Editor and are not described here.

Summary of Lexical Rules

The lexical elements follow MSC'96. These rules have the following noteworthy properties:

- An underscore followed by on or more spaces is ignored completely, e.g. A_ B denotes the same <name> as AB. This use of underline makes it possible to split keywords over multiple lines since control characters (e.g. newline) is treated as a space.
- It is possible to have identifiers consisting entirely of numeric characters; e.g. "223" is a valid identifier.
- Identifiers are not case sensitive.
- Comments (<note> in Z.120) can be used anywhere between lexical units. A <note> is started by the characters /* outside a <note> and terminated by the characters */ inside a <note>.

For more information on the MSC lexical rules, see the Z.120 recommendation.

Syntax rules in Symbols

The descriptions below describes what text is allowed in the different symbols, it is not a description of the grammar in PR-form.

The grammar below informally describes the lexical units used as terminal symbols. Refer to Z.120 for a complete description.

```
<name> ::= identifier as described above.  
<text> ::= approximately the ASCII character set.
```

1. No checks are made on completeness, however.

In the sections below each symbol will be described in the following manner:

1. A *short* description of the symbol and/or its contents and purpose.
2. The symbols textual grammar
3. Possibly any semantic restriction and/or notes. Refer to Z.120 for a complete description of the semantics that apply.

Diagram Name Syntax

The diagram name identifies the MSC to the outside world.

```
Diagramname ::= <name>
```

Diagram names must follow certain restrictions since they are used to identify the diagram with respect to other tools.

Page Name Syntax

The page name identifies the page within a document.

```
<page name> ::= <name>
```

Each page name must be unique within its containing diagram.

Text Symbol Syntax

The text in a text symbol is an informal explanatory text.

```
<text text> ::= <text>
```

The text has no (formal) semantic and no restrictions.

Condition Symbol Syntax

Global conditions can be used to restrict how MSC's can be composed in High level MSC's.

```
<condition name list> ::=  
  <condition name> { '\,' <condition name> }*  
  
<condition name> ::= name
```

Global conditions indicate possible continuations of Message sequence charts containing the same the same set of instances by means of condition name identification.

Reference Symbol Syntax

MSC References are used to refer to other MSC's of the MSC document.

```

<msc ref expr> ::=
    <msc ref par expr> { 'alt' <msc ref par expr> }*

<msc ref par expr> ::=
    <msc ref seq expr> { 'par' <msc ref seq expr> }*

<msc ref seq expr> ::=
    <msc ref exc expr> { 'seq' <msc ref exc expr> }*

<msc ref exc expr> ::=
    [ 'exc' ] <msc ref opt expr>

<msc ref opt expr> ::=
    [ 'opt' ] <msc ref loop expr>

<msc ref loop expr> ::=
    [ 'loop' [ <loop boundary> ] ]
    {
        'empty' |
        <msc name> [ <parameter substitution> ] |
        ( <msc ref expr> )
    }

<parameter substitution> ::=
    'subst' <substitution list> 'end'

<substitution list> ::=
    <substitution> [ ';' <substitution list> ]

<substitution> ::=
    <replace message> |
    <replace instance> |
    <replace msc>

<replace message> ::=
    [ 'msg' ] <message name> 'by' <message name>

<replace instance> ::=
    [ 'inst' ] <instance name> 'by' <instance name>

<replace msc> ::=
    [ 'msc' ]
    {
        'empty' |
        { 'empty' | <msc name> } 'by'
        { 'empty' | <msc name> }
    }

<msc name> ::= <name>

<message name> ::= <name>

<instance name> ::= <name>

```

MSC Syntax

While MSC diagrams allows the user to specify the analysis and specification activities in great detail with graphical symbols, there are also fields that get their meaning from textual information only. The different editing support facilities provided by the MSC Editor checks textual data to follow certain syntactic conventions as specified in MSC'96.

This section details the syntax rules that are imposed by the MSC Editor on textual data only. Graphical syntax rules¹ are enforced automatically by the MSC Editor and are not described here.

Summary of Lexical Rules

The lexical elements follow MSC'96. They are identical to the lexical rules for HMSC, see [“Summary of Lexical Rules” on page 1696](#) for further information.

Syntax Rules in Symbols

The descriptions below describes what text is allowed in the different symbols, i.e. it is not a description of the grammar in PR-form.

The grammar below informally describes the lexical units used as terminal symbols. Refer to Z.120 for a complete description.

```
<name> ::= identifier as described above.  
<text> ::= approximately the ASCII character set.
```

In the sections below each symbol will be described in the following manner:

1. A *short* description of the symbol and/or its contents and purpose.
2. The symbols textual grammar
3. Possibly any semantic restriction and/or notes. Refer to Z.120 for a complete description of the semantics that apply.

Syntax Common with HMSC

All symbols that can take textual input in the HMSC are also present (and the same) as those found in the MSC. See [“Syntax rules in Symbols” on page 1696](#) for further information.

1. No checks are made on completeness, however.

Syntax Specific for MSC

In addition to the symbols that are common HMSC symbols, the MSC Editor supports the following symbols that contains text.

Comment Symbol Syntax

The text in a comment symbol is an informal explanatory text.

```
<comment text> ::= <text>
```

The text has no (formal) semantic and no restrictions.

Instance, Message and Timer Name syntax

The text identifies the entity

```
<instance name> ::= name
<message name>  ::= name
<timer name>    ::= name
```

Parameter Syntax

Both on messages and instance creations have parameters. In addition the MSC also supports parameters on timers (currently nonstandard). The Z.120 grammar for parameters is defined as follows:

```
<parameter list> ::=
    <parameter name> [ ',' <parameter list> ]
```

This grammar is neither able to allow empty parameter lists, nor to take parameters that are generated from SDL. Furthermore, the grammar does not allow string literals. The MSC Editor (and associated tools) supports the following, more relaxed, grammar:

```
<parameter list> ::=
    [ <relaxed name> { ',' <relaxed name> } * ]
<relaxed name> ::=
    <parameter name> [ '(' <relaxed name> ')' ]
<parameter name> ::=
    <name> |
    <character string> |
    <character string 2>
```

The grammar of <character string 2> is the same as the grammar for the Z.120 <character string> except that the apostrophe is regarded as the Z.120 <other character> and the double quote "" is regarded as an <apostrophe>.

Instance Kind Syntax

The instance kind describes the type of the instance

```
<instance kind> ::=
    [ <kind denominator> ] <identifier>
<kind denominator> ::=
    'system' | 'block' | 'process' | 'service'
    | <name>
<identifier> ::= [ <qualifier> ] <name>
<qualifier> ::= '<<' <text> '>>'
```

Decomposition Syntax

This text is present if the instance is decomposed and describes the name of the diagram that explains the decomposed instance in greater detail.

```
<decomposition> ::=
    'decomposed' [ <substructure reference> ]
<substructure reference> ::=
    'as' <message sequence chart name>
```

Inline Heading Syntax

This is the syntax for the text area in the inline expressions symbols.

```
<inline heading> ::=
    'alt' |
    'par' |
    'exc' |
    'opt' |
    'loop' [ <loop boundary> ]
<loop boundary> ::=
    '<' <inf natural> [ ',' <inf natural> ] '>'
<inf natural> ::= 'inf' | <natural name>
<natural name> ::= {0|1|2|3|4|5|6|7|8|9}+
```

Literature References

Object Model Literature References

There is a growing number of publications devoted to object modeling techniques. The following two sources have been selected as defining the Object Model supported by the OM Editor:

- [5] OMG Unified Modeling Language, version 1.3, June 1999
(document ad/99-06-08) Final Draft
Object Management Group
<ftp://ftp.omg.org/pub/docs/ad/>
- [6] Object Oriented Modeling and Design
Rumbaugh, Blaha, Premerlani, Eddy, Lorensen
Prentice-Hall (1991)
ISBN 0-13-630054-5

State Chart Literature References

There is a growing number of publications devoted to state chart techniques. The following source has been selected as defining the State Chart supported by the SC Editor:

- [7] Unified Modeling Language, version 1.1, Sept. 1997
UML Semantics (document ad/97-08-04)
UML Notation Guide (document ad/97-08-05)
Object Management Group
<ftp://ftp.omg.org/pub/docs/ad/>
- [8] Unified Modeling Language, version 1.0, January 1997
UML Semantics (document ad/97-01-03)
UML Notation Guide (document ad/97-01-09)
Object Management Group
<ftp://ftp.omg.org/pub/docs/ad/>

MSC'96 Literature References

- [9] Z.120 (1996).
Message Sequence Chart (MSC).
ITU-T, Geneva, April 1996
- [10] Message Sequence Chart
Syntax and Semantics
M.A. Reniers, Eindhoven University of Technology, 1999
IPA Dissertation Series 1999 - 7
- [11] Object-Oriented Software Engineering
– A Use Case Driven Approach.
I. Jacobson.
Addison-Wesley, 1992
- [12] Tutorial on Message Sequence Charts (MSC'96)
Ekkart Rudolph, Jens Grabowski, and Peter Graubman

UML Literature References

- [13] The Unified Modeling Language User Guide
Grady Booch, Ivar Jacobson, James Rumbaugh.
Addison-Wesley, 1998
- [14] The Unified Modeling Language Reference Manual
James Rumbaugh, Ivar Jacobson, Grady Booch.
Addison-Wesley, 1998
- [15] The Unified Software Development Process
Ivar Jacobson, James Rumbaugh, Grady Booch.
Addison-Wesley, 1999

